Repair Manual
Jetta, Jetta SportWagen, Golf, Passat 2010 ➤

Generic Scan Tool

Engine ID	CBT A	CBU A							

Edition 07.2022

Service

List of Workshop Manual Repair Groups

Repair Group

ST - Generic Scan Tool

Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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Contents

ST – Generic Scan Tool

1 General Information

(Edition 07.2022)

Included in the contents of this Generic Scan Tool (GST) manual is a summary table of the vehicle specific OBD II Emission Related DTCs. The DTC table contains DTC Malfunction Criteria, Threshold Values, Secondary Parameters, Enabling Conditions, Monitoring Time Length, Frequency of Checks, and MIL Illumination information which can be used to accurately monitor and diagnose emissions related faults and perform functions required to run Modes 01 through 0A (if applicable) with a hand held scan tool.

This manual also contains the step by step procedures to accurately diagnose and repair a component or system once a DTC has been set. References to repair procedures and wiring diagrams can be found within the diagnostic test procedures.

- ⇒ P1.1 recautions”, page 2
- ⇒ W1.2 orking Conditions”, page 4

1.1 Safety Precautions

Check for Technical Bulletins that may supersede any information included in this manual.

WARNING

Failure to follow these instructions may result in personal injury or possible death.

Check the Technical Bulletins for information, cautions and warnings that may supersede or supplement any information included in this manual.

When performing the drive cycle operation, pay strict attention to driving conditions and observe and obey all posted speed limits.

Test equipment must always be secured to the rear seat and operated by a second person. If test and measuring equipment is operated from the passenger seat, the person seated could be injured in the event of an accident involving deployment of the passenger-side airbag.

The fuel system is under pressure! Before opening the fuel system, place rags around the connection area. Then release pressure by carefully loosening the connection.

The engine section of the fuel system, after the high pressure pump, is under extremely high pressure! When working on engine or fuel injection system, fuel pressure must be relieved to residual pressure before opening high pressure components. Refer to the Service Manual for the proper procedure.

If the battery has not been disconnected, the fuel pump fuse must be removed before opening the fuel supply system as the fuel pump may be activated by the driver's door contact switch.

Testing of the EVAP and ORVR systems can result in the escape of explosive fuel vapor. Do not smoke while testing the EVAP system, and make sure the area you are working in is well ventilated.

Observe the following for all procedures, especially in the engine compartment due to lack of room:

- *Route lines of all types (e.g. for fuel, hydraulic, EVAP canister system, coolant and refrigerant, brake fluid, vacuum) and electrical wiring so that the original path is followed.*
- *Watch for sufficient clearance to all moving or hot components.*
- *Do not touch or disconnect the Ignition Coils, ignition wires, connecting parts or adapter cables when the ignition is on or the engine is running or turning at starting RPM.*
- *Only disconnect and reconnect wires for injection and ignition system, including test leads, when the ignition is turned off.*

When removing and installing components from full or partially full fuel tanks, observe the following:

- *The fuel tank must only be partially full. How much fuel can remain in the fuel tank may be read in the respective work description. Empty the fuel tank if necessary.*
- *Before starting work, switch on the exhaust extraction system and place an extraction hose close to the installation opening of the fuel tank to extract escaping fuel fumes. If no exhaust extraction system is available, a*

radial fan (as long as motor is not in air flow) with a displacement greater than 15 m^3/h can be used.

- *Prevent fuel from contacting the skin! Wear fuel-resistant gloves!*

When servicing the engine control module (ECM), it may be necessary to use a heat gun. The heat gun, shear bolts, and parts of the protective housing will become extremely hot. Use extreme caution when working with or handling these parts to avoid personal injury.

Observe operating instructions when working with a heat gun. To prevent damage (burning) to the wiring and harness connections, insulation and the electronic components, perform outlined work steps exactly!

The cooling system is under pressure. To avoid scalding, use caution when opening the cooling system and servicing cooling system components!

Caution

The battery must only be disconnected and connected with the ignition switched off. Otherwise, the engine control module (ECM) can be damaged.

The use of nails, paper clips, or another unauthorized materials to back-probe harness connectors is strictly prohibited and may cause damage to the harness connectors, terminal ends or to a component. Use only the manufacturers test lead kit or an equivalent aftermarket test lead kit for back-probing all harness connectors.

Do not use sealants containing silicone. Particles of silicone drawn into the engine, will not be burned in the engine and will damage the oxygen sensors.

Secure all hose connections with the correct hose clips (the same as original equipment).

If engine is to be cranked without starting (for example; as part of a compression test), remove the fuses for the voltage supply of ignition coils and the fuel injectors.

An electrostatic charge can lead to functional problems of electrical components of the engine, transmission and selector lever mechanism. Touch a grounded object, e.g. a water pipe or a hoist, before working on electrical components.

Do not make direct contact with harness connector terminals.

Use only gold-plated terminals when servicing any component with gold-plated harness connector terminals.

1.2 Clean Working Conditions

Even minor contaminations can lead to malfunctions in the fuel injection system. When working on the fuel supply/injection system, pay careful attention to the following rules of cleanliness:

- Thoroughly clean all connections and the surrounding area before disconnecting.
- Place removed parts on a clean surface and cover. Use lint-free cloths.
- Carefully cover opened components or seal, if repairs are not performed immediately.

- When the system is open, do not work with compressed air. Do not move vehicle unless absolutely necessary.
- Install clean components: Remove the parts being replaced immediately prior to installation of the new parts. Do not use parts that have been stored unpacked (e.g. in tool boxes etc.).
- Electrical connectors that have been disconnected: Protect from dirt and moisture. Make sure connections are clean and dry when reconnecting.

2 Description and Operation

2.1 On Board Diagnostic Systems

On Board Diagnostics, or OBD, is an automotive term referring to a vehicle's self-diagnostic and reporting capability. OBD systems give the vehicle owner or repair technician access to the status of the various vehicle sub-systems. Modern OBD implementations use a standardized digital communications port to provide real-time data in addition to a standardized series of Diagnostic Trouble Codes (DTCs) which allow one to rapidly identify and remedy malfunctions within the vehicle. Legislation mandates a vehicle equipped with OBD-II to light up the fault indicator lamp if its emissions exceed the prevailing limit due to system malfunction.

All cars built since January 1st, 1996 (MY 1996) are equipped with OBD-II systems. Manufacturers started incorporating OBD-II in various models as early as 1994; however, some early OBD-II cars (MY 1994 and MY 1995) were not 100% compliant.

2.2 Evaporative Emission System

The evaporative emission system has been designed to minimize the release of hydrocarbons from the fuel system into the atmosphere. The evaporative emission system components all work together with the ECM to prevent fuel vapor from escaping and route it to the intake manifold to be burned during normal combustion.

The leak detection system checks the integrity of the evaporative emission system by pressurizing the system.

- There are 3 different types of evaporative emission systems used. These systems are explained below.

- ⇒ D2.2.1 etection Pump (LDP) EVAP System”, page 7
- ⇒ L2.2.2 eak Diagnostic Module (DM - TL) EVAP System”, page 7
- ⇒ V2.2.3 acuum Leak Detection (NVLD) EVAP System”, page 7
- ⇒ S2.2.4 ystem, Checking For Leaks”, page 7

2.2.1 Leak Detection Pump (LDP) EVAP System

The leak detection pump (LDP) is integrated into the EVAP system and can have two functions. The LDP can:

- ♦ Pressurize the EVAP system and detect a drop in pressure that would indicate a leak.
- ♦ Function as the EVAP Canister Vent on vehicles that do not have a separate EVAP Canister Vent.

The LDP is a vacuum-driven, ECM controlled, diaphragm pump. In order to operate, the engine must be running and vacuum applied to the Vacuum Switch.

2.2.2 Tank Leak Diagnostic Module (DM - TL) EVAP System

The canister purge valve can be actively checked using the Tank Leak Diagnostic Module (DM - TL). For this purpose the electric pump is shortly activated while the combustion engine is running, to build up a minor pressure in the fuel tank and monitor the pressure decay after opening the canister purge valve. Optionally as a quick pass method, the monitoring can be carried out by passively monitoring the fuel mixture deviation when the canister purge valve is opened. If a significant fuel mixture deviation is detected, the purge valve monitor passes. The Tank Leak Diagnostic Module (DM - TL) consists of an electrically operated air pump, an orifice with a defined diameter serving as a reference leak, and a change-over valve switching the air flow between the reference leak and the tank. If neither the pump nor the change-over valve is activated, the tank is ventilated through a bypass in the module.

2.2.3 Natural Vacuum Leak Detection (NVLD) EVAP System

The system utilizes an engine-off natural vacuum evaporative system integrity check that tests for leaks with a diameter of 0.020 inch while the engine is off and the ignition is off. The natural vacuum leak detection (NVLD) evaporative system integrity check uses a pressure switch to detect evaporative system leaks. The correlation between the pressure and the temperature in a sealed system is used to generate a vacuum in the tank when the temperature drops. If a sufficient temperature drop is detected for a minimum time period, the vacuum level in a sealed system will exceed the threshold to close the NVLD pressure switch. Therefore, if the switch does not close under these conditions, a leak is detected. If the switch closes, the system is considered to be leak-free.

2.2.4 EVAP System, Checking For Leaks

The following procedure is used to diagnose EVAP System leaks.

Special tools and workshop equipment required

- ♦ Smoke tester.
- ♦ EVAP and Fuel Supply System Vacuum hose and line routing diagram.

Leak checking

– Using a Smoke tester, check the Evaporative Emission (EVAP) canister system for leaks.

– Always follow the manufacturers directions for the proper installation and operation of the smoke tester being used.

If a leak is detected:

– Check the fuel filler cap seal for damage and for proper installation. Replace if necessary.

– Check all hose connections of the fuel supply system and replace or repair any leaking lines.

– Check all hose connections of the EVAP system and replace or repair any leaking lines.

– Check that the seal under the locking flange is properly tightened on the fuel tank.

– Secure all hose connections using appropriate fittings for the model type.

– Replace seals and gaskets when performing repair work.

– Repair or replace any damaged component.

If no leaks are found in the EVAP system:

– Erase the DTC memory if a DTC was set. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 .

– Perform a road test to verify repair.

If a DTC was set and does not return:

Diagnosis complete. Generate readiness code. Refer to ⇒ C3.2 ode", page 15 .

If the same DTC does return and no leaks are found in the EVAP system:

– Check for any related TSB's.

– Perform the diagnostic test procedure for the suspected component.

2.3 Electronic Throttle Control (ETC) System

The electronic throttle control (ETC) system consists of the accelerator-pedal module, the engine control module (ECM), and the electronic throttle body. The electronic throttle body mainly consists of the throttle valve, the electric throttle-valve drive element, and the throttle-valve position sensor (TPS). The drive element is a DC servomotor, which acts on the throttle-valve shaft via a gear unit. The throttle-valve position sensor is a redundant sensor system that detects the position of the throttle valve. The sensors have opposite resistance curves so that the ECM can always cross check the signals to ensure the correct position of the throttle valve is always known.

The driver command is detected by a redundant sensor system in the accelerator-pedal module, and the signal is sent to the engine control module. The engine control module then determines the required throttle-valve position by performing calculations from data measured by sensors such as accelerator pedal position sensor, engine speed sensor and vehicle speed sensor. The actual throttle opening can be more or less in proportion to accelerator pedal position given different engine operating points.

2.4 Electronic Power Control (EPC) Warning Lamp

When the ignition is switched on, the engine control module (ECM) checks the electronic throttle control system for static system integrity (e.g. circuit integrity, communications, etc); the electronic power control (EPC) warning light is turned on via the Instrument Cluster during this process. Shortly after engine

start, the EPC warning light is turned off if no malfunction in the electronic throttle control system is detected. In the event of a malfunction while the engine is running, the ECM will activate the EPC warning light via the Instrument Cluster and at the same time, a Diagnostic Trouble Code (DTC) is stored in the ECM memory.

2.5 Engine Control Module (ECM)

The Engine Control Module (ECM) is a generic term for any embedded system that controls one or more of the electrical systems or subsystems in a vehicle. It controls a series of actuators on an internal combustion engine to ensure that driver commands (e.g. to accelerate) are translated into appropriate engine performance. It reads values from a multitude of sensors, interprets the data, and adjusts the engine actuators accordingly. The ECM also interacts with the transmission control module (TCM), ABS/traction/stability control module and other vehicle function related control systems.

ECM controlled systems and functions (performance and emission related) will be introduced in the following chapters. These include the OBD system, controller area network (CAN), throttle control module, fuel supply, ignition, variable valve timing, exhaust-gas recirculation, secondary air injection, exhaust system, and EVAP system.

2.6 Malfunction Indicator Lamp (MIL)

When the ignition is switched on, the Engine Control Module (ECM) performs checks on static system integrity (e.g. circuit integrity, communications, etc). The Malfunction Indicator Lamp (MIL) is switched on during this process via the Instrument Cluster. After engine starts, the ECM examines engine operation for potential malfunction(s) or failure(s) that can lead to increased emission values. If no malfunction is detected, the ECM switches off the MIL via the Instrument Cluster.

In the event of a malfunction during the operation of the engine, the ECM will activate the MIL via the instrument cluster and at the same time, a Diagnostic Trouble Code (DTC) is stored in the ECM memory. In OBD systems, the MIL can have up to three stages: steady, flashing and Stop Vehicle. A steady MIL indicates a minor fault (e.g. a failing oxygen sensor) whereas a flashing MIL indicates a more severe malfunction that could result in damage of engine or exhaust system components (e.g. the catalytic converter) if left uncorrected for an extended period. This would also indicate a severe fault. The three stages are 1. ON, then OFF; 2. ON steady; 3. flashing constantly. The 3rd stage indicates damage may occur and driver must stop.

2.7 Controller Area Network (CAN)

Overview

The Controller Area Network (CAN) bus is a message-based protocol that allows control units and devices to communicate with each other using a shared network. With this system, control units of the various electronic systems are no longer interconnected by multiple separate cables. This does away with a large number of electrical connections and results in a reduced likelihood of failure of the device network.

Broadcast Communication

Each of the devices on the network has a CAN circuit and is therefore is considered “intelligent”. All devices on the network see all transmitted messages. Each device can determine if a message is relevant or if it should be filtered out. This structure allows modifications to CAN networks with minimal impact. Ad-

ditional non-transmitting nodes can be added without modification to the network.

Priority

Every message has an assigned priority. If two nodes try to send messages simultaneously, the one with the higher priority gets transmitted and the one with the lower priority gets postponed. This arbitration does not affect other messages and results in non-interrupted transmission of the highest priority message

2.8 Fuel Supply

Overview

The fuel supply system delivers fuel to an internal combustion engine. With carburetors being replaced by fuel injections systems in the late 1980s and 1990s, the most common types of fuel supply system currently in use are throttle body injection (single-point injection), multiport injection (MPI) and direct injection (DI).

Fuel injectors atomize fuel because high pressure is forcing the fuel through a small nozzle in the injector into the intake air stream or the combustion chamber. This process is often controlled by the ECM and is dependent on data received from other sources (e.g. mass air flow sensor, throttle position sensor, etc.) to determine the precise amount of fuel needed for any given operating condition. The primary advantages of fuel injection over carburetor are improved fuel economy, increased power output and reduced emissions. The following sections will discuss each fuel injection concept in detail.

Throttle Body Injection

Throttle body injection uses a single electrically controlled injector at the throttle body. The fuel is drawn by an electric fuel pump out of the fuel tank and flows through a paper filter into the fuel injector. Since injection happens at the same location as the carburetor, very little engine redesign (intake manifold, fuel line routing, etc.) is necessary. The cost saving of throttle body injection compared to other fuel injection methods encouraged vast adoption in the late 1980s and early 1990s.

Throttle body injection system also inherits many disadvantages of the carburetor. One of them being the inability to precisely control the amount of fuel supplied into each cylinder, and is unable to precisely control combustion and emissions. It also restricts the design of intake manifold as any sharp bends in the intake path will cause atomized fuel to accumulate on the outer wall of the intake path. Supplying moderate engine heat to the intake manifold is also necessary to ensure that the fuel stay vaporized. This results in a relatively high intake air temperature and compromises performance.

Multiport Injection (MPI)

Multiport injection (MPI) consists of an injector for each cylinder just upstream of the intake valve. The fuel pump delivers the fuel into a high-pressure line where it flows to the fuel rail and injectors. When activated by the ECM, each injector sprays fuel at the intake port of its corresponding cylinder – this allows individual cylinders to receive the right amount of fuel in a more precisely timed manner. Sequential fuel injection mode can be applied to activate each injector individually to improve engine response. Lowered fuel consumption and emissions are also achieved.

Sequential multiport injection is still the most common fuel injection system found on most economy cars thanks to its high efficiency, control simplicity and low manufacturing cost (compared to direct injection). However, to further improve drivability

(performance) while reducing emissions and fuel consumption, direct injection becomes a superior alternative.

Direct Injection

Injectors in directly injected (DI) engines are mounted on the cylinder head and fuel is injected directly into the engine’s combustion chamber. In order to overcome the pressure in the combustion chamber during compression and power stroke, injectors often operate at a primary pressure as high as 3000 psi. At such extreme pressure level, no single fuel pump can supply the required pressure directly from the fuel tank to the injectors. Instead, a low-pressure and a high-pressure system are employed. The low-pressure system principally utilizes the same fuel systems and components for multiport injected engines. The high-pressure system consists of a high-pressure fuel pump driven directly by the camshaft, a fuel rail (high-pressure accumulator), a high-pressure sensor and, depending on the system, a pressure-control valve or a pressure limiter. The injectors are operated by the ECM to send a precise amount of fuel from the high-pressure rail directly into the combustion chamber.

The distinctive difference between direct injection and other injection methods is that direct injection offers the flexibility regarding when in the combustion cycle the fuel is added and how. MPI systems can only add fuel during induction; A DI system can add fuel whenever it needs to. For example, fuel can be added during induction to create a homogeneous charge then added again after ignition to enhance power delivery under full load conditions.

VW/Audi Fuel Stratified Injection (FSI)

The goal of a stratified-charge operation is to form an ignitable mixture near the spark plug at the instant of ignition. This means that, instead of supplying the corresponding stoichiometric fuel quantity to the amount of air in the combustion chamber, the fuel interacts only with a portion of the air before it is conveyed to the spark plug. The rest of the fresh air surrounds the stratified charge allowing an ultra-lean condition with air-fuel ratio exceeding 50:1 in some instances. As less fuel is used to “burn” more air, stratified injection helps to further reduce fuel consumption when the engine is operating in low-load conditions (e.g. highway cruising). This is created by designing the combustion chamber so that a “swirling” effect of the air-fuel charge is caused.

2.9 Ignition and Timing

Ignition

A spark ignition (SI) engine requires a spark to initiate combustion in the combustion chamber. Voltage is supplied to the spark plug where the electricity will arc across a gap at a voltage as high as 100 kilovolts. The ECM determines the precise moment to fire each spark plug using ignition logic which is preprogrammed into the ECM as a function of engine speed and load. An optimally calibrated ignition system ensures consistent and reliable ignition under all conditions. Knock or misfire as a result of incorrect ignition can lead to destruction of engine components or damage of the catalytic converter.

Timing

Shifts in the moment of ignition (ignition timing) can result in increased emissions, decreased performance and fuel economy. Whereas more spark advance improves power and fuel economy, it also raises HC and NOx emissions. Excessive spark advance can cause engine knock which is potentially destructive to engines. If the ECM detects knock from a signal sent by a knock sensor, it will delay (retard) the timing of the spark. Excessive spark retard lowers power output and produces high

exhaust temperatures, which can also harm the engine. Carefully designed ignition logic provides optimum timing that best balances performance, fuel economy and emissions.

2.10 Variable Valve Timing

Engines equipped with variable valve timing provide the option of adjusting the phase of the camshaft with respect to the crankshaft. This allows the ECM to control the time at which the valves open or close, and therefore better assists engine “breathing” at various engine speeds. When engine speed increases, the duration of intake and exhaust stroke shortens so that less fresh air can be drawn into the combustion chamber and less exhaust gas can escape. In such a scenario, the ECM opens the intake valve before the exhaust gas has completely left the combustion chamber, and their considerable velocity assists in drawing in the fresh charge – this is referred to as “valve overlap”.

In addition to valve timing, some engines also employ variable valve lift that switches to a more aggressive camshaft-lobe profile as engine speed increases. A more aggressive camshaft-lobe profile actuates valves more rapidly and lifts valves to a greater magnitude in comparison to a normal camshaft-lobe profile. This improves intake and exhaust flow rate, allowing engines to raise maximum operating speed and power output.

2.11 Exhaust-Gas Recirculation (EGR) System

Exhaust-Gas Recirculation (EGR) can be utilized to control the cylinder charge and therefore the combustion process. The exhaust gas that is recirculated to the intake manifold increases the proportion of inert gas in the fresh gas filling; this results in a reduction in the peak combustion temperature and, in turn, a drop in temperature-dependent NOx emission.

Exhaust-gas recirculation is made possible by a connection between the exhaust pipe and the intake manifold. Due to the pressure differential, the intake manifold can draw in exhaust gas via this connection. Together with the exhaust-gas recirculation valve, the ECM adjusts the opening cross-section and therefore controls the partial flow tapped from the main exhaust flow. A malfunction in exhaust-gas recirculation system can result in performance loss and increased emissions. In such a scenario, the Malfunction Indicator Lamp (MIL) lights up and a Diagnostic Trouble Code (DTC) is stored in the ECM memory.

2.12 Secondary Air Injection

Additionally injecting air into the exhaust pipe triggers an exothermic (release of heat) reaction. This leads to the combustion of HC and CO components that prevail mainly during the warm up phase. This oxidation process releases additional heat. Consequently, the exhaust gas becomes hotter, causing the catalytic converter to heat up at a faster rate. For spark-ignition engines, secondary-air injection is an effective means of reducing HC and CO emissions after starting the engine and to rapidly heat up the catalytic converter. This ensures that the conversion of NOx emissions commences earlier.

An electronically controlled valve operates the secondary-air valve (a one-way check valve). The ECM actuates the pump and the control valve, ensuring that secondary air can be injected at a defined point in time. The secondary air must also be injected as close to the outlet valve as possible in order to exploit the high temperatures to utilize the exothermic (release of heat) reaction effectively.

2.13 Exhaust Systems

Overview

There are three important functions of the exhaust system: to reduce the pollutants in exhaust gas, muffle engine combustion noise and to discharge exhaust gas at a convenient location on the vehicle (often underneath the rear bumper). A passenger-car exhaust system consists of the following; exhaust manifold, exhaust treatment components, sound absorption components and the system of pipes connecting these components.

Exhaust Manifold

The manifold is an important component in the exhaust system. It routes the exhaust gas out of the cylinder outlet ports into the subsequent exhaust system. The geometry of the manifold (i.e. length and cross-section of the individual pipes) has an impact on the performance characteristics, the acoustic behavior of the exhaust system, and the exhaust temperature. In some cases, the manifold is insulated with an air gap to quickly reach high exhaust temperature and to shorten the time taken by the catalytic converter to reach its operating temperature.

Emission Control

The primary emission control component is the catalytic converter, which breaks down the gaseous pollutants in the exhaust gas (CO, HC and NOx). Catalytic converters are installed as close as possible to the engine so that they can quickly reach their operating temperature and therefore be effective in urban driving. It also bears a sound-absorbing function, especially to the higher frequency portion of the engine combustion noise.

Sound Absorption

Mufflers dampen or absorb the noise produced by engine combustion. In principle, they can be installed at any position in the exhaust system. However, they are mostly located in the middle and rear sections of the exhaust system. Depending on the number of cylinders and engine output, generally 1 to 3 mufflers are used in an exhaust system. In V-engines, the left and right cylinder banks are often run separately, each being fitted with its own catalytic converters and mufflers. Although the aim of mufflers is to reduce noise in compliance with legislations, they can also help to create the sound specific to the type of vehicle.

3 Diagnosis and Testing

3.1 Preliminary Check

Note

- *Before performing any pin point test or component diagnosis, a Preliminary Check must be performed.*
- *Check for Technical Bulletins that may supersede any information included in the repair manual or GST Manual.*

- For Electrical Testing: Refer to ⇒ page 14 .
- For Fuel System Mechanical Testing: Refer to ⇒ page 15 .
- For Oxygen Sensor Preliminary Tests: Refer to ⇒ page 15 .

Electrical Testing

Step	Procedure	Result / Action to Take
1	• CONNECT: Scan Tool. • IGNITION: ON. • CHECK: For stored or related DTCs. – Were any other DTCs stored?	– YES: ♦ GO TO: Step 2 ⇒ page 14 . – NO: ♦ GO TO: Step 3 ⇒ page 14 .
2	• Repair these DTCs first before performing any of the following steps.	♦ GO TO: Proper Diagnostic procedure per the stored DTC. Refer to ⇒ D3.4 TC Tables”, page 73 .
3	• Using the Scan Tool, erase the DTC memory. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory”, page 22 . • Perform a road test to attempt to duplicate the customers complaint. – Does DTC return?	– YES: ♦ GO TO: Step 4 ⇒ page 14 . – NO: ♦ GO TO: Step 5 ⇒ page 14 .
4	• Perform the diagnostic procedure for that DTC.	♦ GO TO: Proper Diagnostic procedure per the stored DTC. Refer to ⇒ D3.4 TC Tables”, page 73 .
5	• FAULT: Intermittent or a sporadic condition. • CHECK: Suspected components. • PERFORM: Visual Inspection of wiring and components. • CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. • REPAIR: Faulty wiring or connector.	♦ Perform a road test to verify the repair. ♦ Generate readiness code. Refer to ⇒ C3.2 ode”, page 15 .

Fuel System Mechanical Testing

Check the following items for possible mechanical delivery deficiency:

- Fuel level in tank is too low.
- Fuel lines pinched.
- Fuel filter plugged.
- Fuel pump delivery unit internal leak.
- Clogged injectors.
- Poor fuel quantity delivery. Refer to appropriate repair manual.

Oxygen Sensor Preliminary Tests

Check for the following conditions which can cause Oxygen Sensor Faults to set without requiring Oxygen Sensor replacement:

Common issues for lean faults:

- ♦ Vacuum leaks - check for failed or loose vacuum lines, leaking intake gaskets, or any other source of un-metered air leaks (leaks after the Mass Air Flow Sensor).
- ♦ Restricted fuel filter or bent/pinched fuel system lines.
- ♦ Incorrect input from other sensors, such as the Mass Air Flow Sensor, which may not always set a fault.
- ♦ Engine misfire.
- ♦ Exhaust leaks.
- ♦ Camshaft timing.

Common issues for rich faults:

- ♦ Leaking or faulty fuel injector.
- ♦ Fuel injector driver shorted in ECM, or wiring short for injectors (short to ground).
- ♦ Leaking or faulty fuel pressure regulator or restricted return line.
- ♦ Faulty fuel pump or fuel pump driver module.
- ♦ Incorrect input from other sensors, such as the Mass Air Flow Sensor, which may not always set a fault.
- ♦ Aftermarket components or performance chips.
- ♦ Camshaft timing.

3.2 Readiness Code

> ⚠ Caution
>
> *When performing the Readiness drive cycle operation, pay strict attention to driving conditions and observe and obey all posted speed limits.*

Readiness code description

Diagnostics are performed at regular intervals during normal vehicle operation. After repairing an emissions related system, a readiness code is generated by road testing the vehicle.

If a malfunction is recognized during the drive cycle, it will be stored in the DTC memory.

The OBD drive cycle operation will be monitored with a hand held diagnostic tool. Consult the manufacturer's instruction manual for correct tool operation.

The readiness code is erased every time the DTC memory is erased or any time the battery is disconnected. If the DTC memory has been erased or the battery is disconnected, a new readiness code must be generated.

Only erase the DTC memory if a DTC has been stored.

General recommendations

Most monitors will complete easier and quicker using a “steady-foot” and “smooth” acceleration during the drive cycle operation, cruise, and acceleration modes.

Operating conditions

For the EVAP monitor test, the coolant temperature and the ambient air temperature must be between 10° C and 35° C with a difference between them no greater than 4° C. The ambient air temperature must not change more than 4° C during the drive cycle procedure (e.g. when driving out of a heated workshop in the winter).

Note

Do not assume that the scan tool ID and engine code are correct if the scan tool communicates. The scan tool does not use the ID to establish communication—the units are automatically identified.

Test requirements

- NO DTC in memory.
- Switch OFF all electrical and electronic accessories.
- Necessary driving speed: 50 – 70 mph.
- Drive profile takes approximately 60 – 90 min.

Readiness Drive Cycle Procedure

– CONNECT: Scan Tool.

Step	Procedure	Result / Action to Take
1	Activate Monitors: • START: Engine and idle for 2 – 3 min.	♦ Monitoring Active. ♦ Executes Misfire Monitoring.
2	O2 Sensor Monitoring: • DRIVE: Vehicle at 45 – 55 mph for a continuous 7 minute period. Avoid stopping.	♦ Executes O2 Sensor Monitoring. ♦ Executes Fuel Trim Monitoring. ♦ Executes EVAP Monitoring.
3	Fuel Cut-Off Monitoring: • ACCELERATE: Vehicle to an engine speed of 5,000 RPM; lift off the throttle until the engine speed is around 1,200 RPM.	♦ Fuel Cut-Off Monitoring Ready.

Step	Procedure	Result / Action to Take
4	Catalyst Monitoring: • ACCELERATE: Vehicle smoothly to 60 – 65 mph, cruise at a constant speed for 5 min.	♦ Executes Catalyst Monitoring. ♦ Executes O2 Sensor Monitoring. ♦ Executes Fuel Trim Monitoring. ♦ Executes Misfire Monitoring. ♦ Executes EVAP Monitoring.
5	Secondary Air Injection, EVAP Monitoring: • DRIVE: Vehicle for 30 – 40 min. at a constant speed of 50 – 70 mph in high gear for 2 min with no coasting.	♦ Executes Secondary Air Injection Monitoring. ♦ Executes EVAP Monitoring. • Check the status of the readiness code.

– If any engine monitor fails the drive cycle test. Repeat the drive cycle test until all engine monitors have successfully run through and passed.

Note

- *When repeating the drive cycle operation for a failed evaporative or thermostat monitor, allow the engine to cool until the coolant temperature and the ambient air temperature are between 10° C and 35° C with a difference between them no greater than 4° C and then repeat the drive cycle operation.*
- *Depending on the scan tool used, the readiness code status may be displayed as complete, passed or OK. At an ambient air temperature < 7° C, the setting of the readiness for the NOx catalytic converter test is delayed. Here the vehicle must be driven considerably longer.*

Readiness Codes and Monitoring Completed

1 - If any engine monitor fails the drive cycle test, repeat the drive cycle test until all engine monitors have successfully run through and passed.

2 - If the drive cycle operation fails again:

3 - Check the DTC memory for stored DTCs.

4 - Repair the vehicle if necessary.

5 - Repeat the drive cycle operation until all engine monitors have successfully run through and passed.

6 - Remove the scan tool and switch the ignition off.

3.3 Diagnostic Modes 01 – 0A

The information provided in Modes 01 through 09 displays the various levels of emission related data that may be monitored, as well as the ability to retrieve and read stored DTC trouble codes, erase stored DTC trouble codes, generate readiness codes, and select the various PIDs and Test-IDs used within the modes to monitor the engine, and emission related component parameters.

Note

Depending on scan tool and protocol used, the information in diagnostic mode 01 may be referred to by different names such as Test-ID (TID), Hex-ID, Component-ID (CID), or On-Board Diagnostic Monitor Identifier (OBDMID).

- ⇒ M3.3.1 ode 01 – Read Current System Data", page 18
- ⇒ M3.3.2 ode 02 – Read Operating Conditions", page 19
- ⇒ M3.3.3 ode 03 – Read DTC Memory", page 21
- ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22
- ⇒ M3.3.5 ode 05 – Read Oxygen Sensor Monitoring Test Results", page 23
- ⇒ M3.3.6 ode 06 – Read Test Results for Specific Diagnostic Functions, 2010 MY", page 23
- ⇒ M3.3.7 ode 06 – Read Test Results for Specific Diagnostic Functions, 2011 MY", page 33
- ⇒ M3.3.8 ode 06 – Read Test Results for Specific Diagnostic Functions, 2012 MY", page 42
- ⇒ M3.3.9 ode 06 – Read Test Results for Specific Diagnostic Functions, 2013 MY", page 51
- ⇒ M3.3.10 ode 06 – Read Test Results for Specific Diagnostic Functions, 2014 MY", page 60
- ⇒ M3.3.11 ode 07 – Read Faults Detected During the Current or Last Driving Cycle", page 70
- ⇒ M3.3.12 ode 08 – Request Control of On-Board System, Test or Component", page 71
- ⇒ M3.3.13 ode 09 – Read Vehicle Information", page 71
- ⇒ M3.3.14 ode 0A – Check Permanent DTC Memory", page 72

3.3.1 Diagnostic Mode 01 – Read Current System Data

Note

Depending on the scan tool and protocol used, the information in diagnostic mode 01 may be referred to by different names such as Test-ID (TID), Hex-ID, Component-ID (CID), or On-Board Diagnostic Monitor Identifier (OBDMID).

Diagnostic Mode 01 makes it possible to access current emissions-related measured values and diagnostic data. The original measured values (no replacement values), input and output data and system status information are displayed using Diagnostic Mode 01.

Test requirement

- Coolant temperature at least 80° C.

Procedure

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 01: Obtain data”.

– From the following table, select the desired “PID” that is to be monitored, e.g. “PID 05 Coolant Temperature”.

The current values of the component or system that is being monitored will be displayed on the scan tool screen.

PID	Component or System
$01:	Monitoring Status Since Erasing DTC Memory
$03:	Condition Of Fuel System
$04:	Calculated Load Value
$05:	Coolant Temperature
$06:	Short Term Air Fuel Ratio
$07:	Long Term Air Fuel Ratio
$0B:	Intake Manifold Absolute Pressure
$0C:	Engine RPM
$0D:	Vehicle Speed
$0E:	Ignition Timing Advance For #1 Cylinder
$0F:	Intake Air Temperature
$11:	Absolute Throttle Position
$12:	Secondary Air Injection
$13:	Oxygen Sensor Bank 1 Sensor 1
$15:	Oxygen Sensor Bank 1 Sensor 2
$16:	Oxygen Sensor Bank 1 Sensor 3
$1F:	Time Since Engine Start
$21:	Distance Driven With MIL On
$2E:	Commanded Evap Purge
$30:	Warm Up Counts After MIL Erased
$31:	Distance Driven After Erasing DTC Memory
$33:	Barometric Pressure
$34:	Heater Current Bank 1 Sensor 1
$3C:	Calculated Catalyst Temperature
$41:	Monitor Status Current Drive Cycle
$42:	Control Module Voltage
$43:	Absolute Load Value
$44:	Air/Fuel Commanded Equivalence Ratio
$45:	Relative Throttle Valve Position
$46:	Ambient Temperature
$47:	Absolute Throttle Valve Position B
$49:	Accelerator Pedal Position D
$4A:	Accelerator Pedal Position E
$4C:	Specified Throttle Valve Position
$56:	Long Term Secondary O2 Sensor Fuel Trim Bank 1

– Switch the ignition off.

3.3.2 Diagnostic Mode 02 – Read Operating Conditions

When an emissions-related fault (pending DTC, visible in mode 07) is first detected, operating conditions are stored. Diagnostic

Mode 02 makes it possible to access this freeze frame data as soon as this fault is shown in Diagnostic Mode 03. Each control module only shows freeze frame data for one fault via Diagnostic Mode 02. Therefore, there are two priority levels. If there is a malfunction with higher priority, the freeze frame data is overwritten.

– Fault with higher priority: Misfire malfunction or fuel trim malfunction.

– Fault with normal priority: All other emissions-related faults.

Note

Depending on scan tool and protocol used, the information in Diagnostic Mode 02 may be referred to by different names such as Test-ID (TID), Hex-ID, Component-ID (CID), or On-Board Diagnostic Monitor Identifier (OBDMID).

Procedure

– Connect the scan tool.

– Start the engine and run at idle.

Note

If the engine does not start, crank the engine using starter for at least 5 seconds, do not switch the ignition off afterward.

– Select “Diagnostic Mode 02: Obtain operating conditions”.

– From the following table, select the desired “PID”, e.g. “PID 05 Coolant Temperature” that is to be monitored.

The current values of the component or system that is being monitored will be displayed on the scan tool screen.

PID	Component or System
$02:	DTC Which Triggered Freeze Frame Data
$03:	Fuel System Status
$04:	Calculated Load Value
$05:	Engine Coolant Temperature
$06:	Short Term Air Fuel Ratio
$07:	Long Term Air Fuel Ratio
$0B:	Intake Manifold Absolute Pressure
$0C:	Engine RPM
$0D:	Vehicle Speed
$0E:	Ignition Timing Advance For #1 Cylinder
$0F:	Intake Air Temperature
$11:	Absolute Throttle Valve Position
$12:	Secondary Air Injection
$1F:	Time Since Engine Start
$2E:	Commanded Evap Purge
$33:	Barometric Pressure
$42:	Control Module Voltage
$43:	Absolute Load Value
$44:	Air/Fuel Commanded Equivalence Ratio

PID	Component or System
$45:	Relative Throttle Valve Position
$46:	Ambient Temperature
$47:	Absolute Throttle Valve Position B
$49:	Accelerator Pedal Position D
$4A:	Accelerator Pedal Position E
$4C:	Specified Throttle Valve Position
$56:	Long Term Secondary O2 Sensor Fuel Trim Bank 1

– Switch the ignition off.

3.3.3 Diagnostic Mode 03 – Read DTC Memory

Diagnostic Mode 03 makes it possible to read emissions-related faults (confirmed DTCs; faults which have activated the MIL) in the ECM and in the TCM.

When the ECM recognizes an emissions-related fault in two consecutive drive cycles, it sends a request to the instrument cluster over the CAN to turn on the malfunction indicator lamp. If an electronic throttle malfunction is recognized, the ECM will send a request to the instrument cluster over the CAN to turn on the electronic power control warning lamp.

The DTCs are sorted by SAE code with the DTC tables consisting of a 5-digit alphanumeric value.

Note

Depending on the scan tool and protocol used, diagnostic mode 03 and the information provided may be referred to by a different name.

The following tables provide a breakdown and explanation of the DTC code.

P-Codes

Component group					
P	x	x	x	x	DTC for the drivetrain
Norm-Code					
P	0	x	x	x	Trouble codes defined by SAE with specified malfunction texts
P	1	x	x	x	Additional emission relevant DTCs provided by the manufacturer
P	2	x	x	x	DTCs defined by SAE with specified texts, from MY 2000
P	3	x	x	x	Additional emission relevant DTCs provided by the manufacturer from MY 2000

Component group					
Repair group					
P	x	0	x	x	Fuel and air mixture and additional emission regulations
P	x	1	x	x	Fuel and air ratios
P	x	2	x	x	Fuel and air ratios

P	x	3	x	x	Ignition system
P	x	4	x	x	Additional exhaust system
P	x	5	x	x	Speed and idle control
P	x	6	x	x	Control module and output signals
P	x	7	x	x	Transmission
P	x	8	x	x	Transmission
P	x	9	x	x	Control modules, input and output signals

U-Codes

Component group					
U	x	x	x	x	DTC for network (CAN bus)
Norm-Code					
U	0	x	x	x	Trouble codes defined by SAE with specified malfunction texts

Procedure

– Connect the scan tool.

– Switch the ignition to the ON position.

– Select Diagnostic Mode 03: Interrogating fault memory.

– The stored DTC or DTCs will be displayed on the scan tool screen.

The following table is an example of the DTC information that may be displayed on the scan tool screen:

Indication example	Explanation
P0444	SAE Diagnostic Trouble Code
Evaporative emission canister purge regulator valve	Malfunctioning wiring path or malfunctioning component
Circuit open	Malfunction type as next

– Refer to the DTC tables below for the diagnostic repair procedures.

♦ ⇒ E3.4.1 ngine/Motor Control Module, 2010 MY”, page 74
♦ ⇒ E3.4.2 ngine/Motor Control Module, 2011 MY”, page 185
♦ ⇒ E3.4.3 ngine/Motor Control Module, 2012 MY”, page 301
♦ ⇒ E3.4.4 ngine/Motor Control Module, 2013 MY”, page 418
♦ ⇒ E3.4.5 ngine/Motor Control Module, 2014 MY”, page 535

– Switch the ignition off.

3.3.4 Diagnostic Mode 04 – Erase DTC Memory

Diagnostic Mode 04 makes it possible to erase the DTC memory and to reset all emissions-related diagnostic data. In that way, all faults in the DTC memory in the ECM and TCM are erased. The adaptation values may also be reset.

Emissions-related diagnostic data includes (as applicable):

- - MIL Status
- - Number of DTCs
- - Readiness bits
- - Confirmed DTCs
- - Pending DTCs
- - DTC that belongs to freeze frame
- - Freeze frame data
- - Test results of specific diagnostic functions
- - Distance driven with MIL on
- - Number of warm-up cycles after erasing the DTC memory
- - Distance driven after erasing the DTC memory
- - Misfire counter

Note

Depending on scan tool and protocol used, diagnostic mode 04 and the information provided may be referred to by a different name.

Procedure

– Connect the scan tool.

– Switch the ignition on.

– Select Diagnostic Mode 03: Interrogating fault memory.

– Then select Diagnostic Mode 04: Reset/delete diagnostic data.

The scan tool will display ”Diagnostic data being erased”.

– Switch the ignition off.

3.3.5 Diagnostic Mode 05 – Read Oxygen Sensor Monitoring Test Results

Note

Mode 05 may not be supported on all systems. On systems where Diagnostic Mode 05 is not supported, refer to Diagnostic Mode 6 for oxygen sensor monitoring test results.

Test Requirements

– No Test requirements are available for this powertrain.

Function Test

– No Function Tests are available for this powertrain.

3.3.6 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, 2010 MY

Diagnostic Mode 06 makes it possible to retrieve test results for special components and systems which are continuously or not continuously monitored. If the diagnosis of a system is complete, the diagnostic result and the corresponding thresholds are saved and displayed in mode 06. This data remains saved

(even with the ignition off) until either new diagnostic results become available or the DTC memory is erased.

The min & max values for each individual test in Mode 06 represent the min & max operating values for a properly operating system. This data is provided to the individual aftermarket scan tool companies for development of their scan tool. Depending on the scan tool being used, the min & max values shown may vary, or be rounded up or down to the nearest decimal point depending on the aftermarket scan tool company's development process.

For example; GST manual documentation will show the value as 0.3499 (units) while the scan tool will display the same value as 0.35 (units).

Depending on the scan tool and protocol used, the information displayed in Diagnostic Mode 06 may be referred to by different names such as Test-ID (TID), Hex-ID, Component-ID (CID), On-Board Diagnostic Monitor Identifier (OBDMID), or contain no name at all and may be referenced by only a number.

Test requirements

- Exhaust system must be properly sealed between the catalytic converter and the cylinder heads.
- No DTCs stored in the DTC memory.
- Coolant temperature at least 80° C.

Work procedure

– Connect the scan tool.

– Start the engine and let run at idle speed.

– Select Diagnostic Mode 06: Check / test the results of components that are not continuously monitored.

Select the desired Test-ID.

The current minimum and maximum values will be displayed on the scan tool screen.

The following table is a numerical list of all “Test-IDs” that may be selected.

Monitor-ID	Component or System
$01: ⇒ page 25	Oxygen Sensor Monitor Bank 1 – Sensor 1
$02: ⇒ page 25	Oxygen Sensor Monitor Bank 1 – Sensor 2
$03: ⇒ page 26	Oxygen Sensor Monitor Bank 1 – Sensor 3
$21: ⇒ page 26	Catalytic Converter Monitoring
$35: ⇒ page 27	VVT Monitor Response Time/Target Error
$3B: ⇒ page 27	Fuel Tank EVAP System Integrity / Leak Test (0.040" / 1.0 mm)
$3C: ⇒ page 28	Fuel Tank EVAP System Integrity / Leak Test (0.020" / 0.5 mm)
$3D: ⇒ page 28	EVAP Purge Flow Monitor
$41: ⇒ page 28	Oxygen Sensor Heater Monitor Bank 1 – Sensor 1
$42: ⇒ page 29	Oxygen Sensor Heater Monitor Bank 1 – Sensor 2
$43: ⇒ page 29	Oxygen Sensor Heater Monitor Bank 1 – Sensor 3
$71: ⇒ page 30	Secondary Air Monitor
$A2: ⇒ page 30	Misfire Cylinder 1 Data
$A3: ⇒ page 31	Misfire Cylinder 2 Data
$A4: ⇒ page 31	Misfire Cylinder 3 Data

Monitor-ID	Component or System
$A5: ⇒ page 32	Misfire Cylinder 4 Data
$A6: ⇒ page 32	Misfire Cylinder 5 Data

Monitor-ID $01: Oxygen Sensor Monitor Bank 1 – Sensor 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $01”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$83	P0133	Oxygen Sensor Signal Dynamic Bank 1 Sensor 1.	0.250	1.999	Refer to DTC P0133 in the DTC summary table. ⇒ page 99
$84	P2195	O2 Sensor Front/Rear Rationality Bank 1 Sensor 1.	- 0.070	0.070	Refer to DTC P2195 in the DTC summary table. ⇒ page 165
$84	P2196	O2 Sensor Front/Rear Rationality Bank 1 Sensor 1.	- 0.070	0.070	Refer to DTC P2196 in the DTC summary table. ⇒ page 166
$89	P0133	Oxygen Sensor Signal Dynamic Bank 1 Sensor 1.	0.250	1.999	Refer to DTC P0133 in the DTC summary table. ⇒ page 99

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $02: Oxygen Sensor Monitor Bank 1 – Sensor 2

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $02”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P2271	Minimum Voltage Threshold From Rich To Lean.	0.0 V	0.8018 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 169
$82	P2270	Maximum Voltage Threshold From Lean To Rich.	0.5980 V	1.1306 V	Refer to DTC P2270 in the DTC summary table. ⇒ page 168

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$8A	P2271	O2 Sensor Minimal Voltage Bank 1 Sensor 2.	0.0 V	0.1500 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 169

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $03: Oxygen Sensor Monitor Bank 1 – Sensor 3

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $03”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P2275	Minimum Sensor Voltage Of Oscillation Bank 1 Sensor 3.	0.0 V	0.8018 V	Refer to DTC P2275 in the DTC summary table. ⇒ page 172
$82	P2274	Maximum Sensor Voltage Of Oscillation Bank 1 Sensor 3.	0.5980 V	1.1306 V	Refer to DTC P2274 in the DTC summary table. ⇒ page 171
$8A	P2275	O2 Sensor Minimum Voltage Bank 1 Sensor 3.	0.0 V	0.1500 V	Refer to DTC P2275 in the DTC summary table. ⇒ page 172

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $21: Oxygen Storage Content of Catalyst

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $21”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$84	P0420	Oxygen Storage Content Value Of Catalyst.	100.0%	655.35%	Refer to DTC P0420 in the DTC summary table. ⇒ page 132

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $35: Variable Valve Timing Monitor

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $35”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$80	P0011	Target Error Intake Bank 1.	- 14.25	28.0	Refer to DTC P0011 in the DTC summary table. ⇒ page 76
$81	P000A	Slow Response Intake Bank 1.	- 14.25	28.0	Refer to DTC P000A in the DTC summary table. ⇒ page 74

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $3B: Fuel Tank EVAP System Integrity / Leak Test (0.040" / 1.0 mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $3B”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$86	P0442	Fuel Tank Leak Test: Small Leak.	900.0 Pa	8,191.75 Pa	Refer to DTC P0442 in the DTC summary table. ⇒ page 135

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $3C: Fuel Tank EVAP System Integrity / Leak Test (0.020" / 0.5 mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $3C”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0456	Fuel Tank Leak Test: Very Small Leak.	5,800.0 ms	65,535.0 ms	Refer to DTC P0456 in the DTC summary table. ⇒ page 138
$82	---	EVAP Monitor System Ok By Initial Purge Check.	29.8 g	6,553.5 g	---
$84	P0456	Fuel Tank Leak Test: Very Small Leak (CBUA).	0.0	0.170	Refer to DTC P0456 in the DTC summary table. ⇒ page 138

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $3D: EVAP Purge Flow Monitor

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $3D”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$8D	P0441	Purge Flow Monitor Valve Closed.	0.0 mA	36.3 mA	Refer to DTC P0441 in the DTC summary table. ⇒ page 134

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $41: Oxygen Sensor Heater Monitor Bank 1 – Sensor 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $41”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$85	P0135	Oxygen Sensor Ceramic Temperature Bank 1 Sensor 1 Monitoring.	715° C	6,513.5° C	Refer to DTC P0135 in the DTC summary table. ⇒ page 100

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $42: Oxygen Sensor Heater Monitor Bank 1 – Sensor 2

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $42”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0141	Oxygen Sensor Heating Internal Resistance Test Bank 1 Sensor 2.	0.0 Ω	20.4 kΩ	Refer to DTC P0141 in the DTC summary table. ⇒ page 107

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $43: Oxygen Sensor Heater Monitor Bank 1 – Sensor 3

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $43”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0147	Oxygen Sensor Heating Bank 1 Sensor 3 Internal Resistance Test.	0.0 Ω	32.4 kΩ	Refer to DTC P0147 in the DTC summary table. ⇒ page 114

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $71: Secondary Air Monitor

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $71”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$82	P0491	Blockage/Leakage Check Bank 1.	0.500	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 140
$84	P0491	Pressure Pulsation Check Bank 1.	0.148 kPa	32.767 kPa	Refer to DTC P0491 in the DTC summary table. ⇒ page 140
$85	P0410	Pressure Check Bank 1.	0.0 kPa	5,000.0 kPa	Refer to DTC P0410 in the DTC summary table. ⇒ page 130
$8A	P2240	Tightness Check Bank 1.	0.0	1.352	Refer to DTC P2440 in the DTC summary table. ⇒ page 180

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A2: Mis-Fire Cylinder 1 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A2”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0301	Cylinder 1 Data Averaged During Last 10 Drive Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 119
$0C	P0301	Cylinder 1 Data Averaged During Current Drive Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 119

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A3: Mis-Fire Cylinder 2 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A3”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0302	Misfire Cylinder 2, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 120
$0C	P0302	Misfire Cylinder 2, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 120

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A4: Mis-Fire Cylinder 3 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A4”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0303	Misfire Cylinder 3, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0303 in the DTC summary table. ⇒ page 121

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0C	P0303	Misfire Cylinder 3, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0303 in the DTC summary table. ⇒ page 121

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A5: Mis-Fire Cylinder 4 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A5”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0304	Misfire Cylinder 4, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0304 in the DTC summary table. ⇒ page 122
$0C	P0304	Misfire Cylinder 4, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0304 in the DTC summary table. ⇒ page 122

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A6: Mis-Fire Cylinder 5 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A6”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0305	Misfire Cylinder 5, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0305 in the DTC summary table. ⇒ page 124
$0C	P0305	Misfire Cylinder 5, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0305 in the DTC summary table. ⇒ page 124

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

3.3.7 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, 2011 MY

Diagnostic Mode 06 makes it possible to retrieve test results for special components and systems which are continuously or not continuously monitored. If the diagnosis of a system is complete, the diagnostic result and the corresponding thresholds are saved and displayed in mode 06. This data remains saved (even with the ignition off) until either new diagnostic results become available or the DTC memory is erased.

The min & max values for each individual test in Mode 06 represent the min & max operating values for a properly operating system. This data is provided to the individual aftermarket scan tool companies for development of their scan tool. Depending on the scan tool being used, the min & max values shown may vary, or be rounded up or down to the nearest decimal point depending on the aftermarket scan tool company's development process.

For example; GST manual documentation will show the value as 0.3499 (units) while the scan tool will display the same value as 0.35 (units).

Depending on the scan tool and protocol used, the information displayed in Diagnostic Mode 06 may be referred to by different names such as Test-ID (TID), Hex-ID, Component-ID (CID), On-Board Diagnostic Monitor Identifier (OBDMID), or contain no name at all and may be referenced by only a number.

Test requirements

- Exhaust system must be properly sealed between the catalytic converter and the cylinder heads.
- No DTCs stored in the DTC memory.
- Coolant temperature at least 80° C.

Work procedure

– Connect the scan tool.

– Start the engine and let run at idle speed.

– Select Diagnostic Mode 06: Check / test the results of components that are not continuously monitored.

Select the desired Test-ID.

The current minimum and maximum values will be displayed on the scan tool screen.

The following table is a numerical list of all “Test-IDs” that may be selected.

Monitor-ID	Component or System
$01: ⇒ page 34	Oxygen Sensor Monitor Bank 1 – Sensor 1
$02: ⇒ page 34	Oxygen Sensor Monitor Bank 1 – Sensor 2
$03: ⇒ page 35	Oxygen Sensor Monitor Bank 1 – Sensor 3

Monitor-ID	Component or System
$21: ⇒ page 36	Catalytic Converter Monitoring
$35: ⇒ page 36	VVT Monitor Response Time/Target Error
$3B: ⇒ page 36	Fuel Tank EVAP System Integrity / Leak Test (0.040" / 1.0 mm)
$3C: ⇒ page 37	Fuel Tank EVAP System Integrity / Leak Test (0.020" / 0.5 mm)
$3D: ⇒ page 37	EVAP Purge Flow Monitor
$41: ⇒ page 38	Oxygen Sensor Heater Monitor Bank 1 – Sensor 1
$42: ⇒ page 38	Oxygen Sensor Heater Monitor Bank 1 – Sensor 2
$43: ⇒ page 39	Oxygen Sensor Heater Monitor Bank 1 – Sensor 3
$71: ⇒ page 39	Secondary Air Monitor
$A2: ⇒ page 40	Misfire Cylinder 1 Data
$A3: ⇒ page 40	Misfire Cylinder 2 Data
$A4: ⇒ page 40	Misfire Cylinder 3 Data
$A5: ⇒ page 41	Misfire Cylinder 4 Data
$A6: ⇒ page 41	Misfire Cylinder 5 Data

Monitor-ID $01: Oxygen Sensor Monitor Bank 1 – Sensor 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $01”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$83	P0133	Oxygen Sensor Signal Dynamic Bank 1 Sensor 1.	0.250 – 0.400	1.999	Refer to DTC P0133 in the DTC summary table. ⇒ page 210
$84	P2195	O2 Sensor Front/Rear Rationality Bank 1 Sensor 1.	-0.070 – - 0.065	0.065 – 0.070	Refer to DTC P2195 in the DTC summary table. ⇒ page 277
$84	P2196	O2 Sensor Front/Rear Rationality Bank 1 Sensor 1.	- 0.065	0.065	Refer to DTC P2196 in the DTC summary table. ⇒ page 278
$89	P0133	Oxygen Sensor Signal Dynamic Bank 1 Sensor 1.	0.250	1.999	Refer to DTC P0133 in the DTC summary table. ⇒ page 210

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $02: Oxygen Sensor Monitor Bank 1 – Sensor 2

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $02”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P2271	Minimum Sensor Voltage Of Oscillation Bank 1 – Sensor 2.	0.0 V	0.5980 – 0.8018 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 281
$82	P2270	Maximum Sensor Voltage Of Oscillation Bank 1 – Sensor 2.	0.5980 – 0.8018 V	1.1306 V	Refer to DTC P2270 in the DTC summary table. ⇒ page 280
$8A	P2271	Oxygen Sensor Minimal Voltage Bank 1 – Sensor 2.	0.0 V	0.1495 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 281
$05	P013A	Oxygen Sensor Transient Time Rich-Lean Bank 1 Sensor 2.	0.0 s	0.500 s	Refer to DTC P013A in the DTC summary table. ⇒ page 216

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $03: Oxygen Sensor Monitor Bank 1 – Sensor 3

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $03”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P2275	Minimum Sensor Voltage Of Oscillation Bank 1 – Sensor 3.	0.0 V	0.6350 – 0.6540 V	Refer to DTC P2275 in the DTC summary table. ⇒ page 284
$82	P2274	Maximum Sensor Voltage Of Oscillation Bank 1 – Sensor 3.	0.5980 – 0.8018 V	1.1306 V	Refer to DTC P2274 in the DTC summary table. ⇒ page 283
$8A	P2275	Oxygen Sensor Minimal Voltage Bank 1 – Sensor 3.	0.0 V	0.1495 V	Refer to DTC P2275 in the DTC summary table. ⇒ page 284

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $21: Oxygen Storage Content of Catalyst

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $21”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$84	P0420	Catalyst Quality Compared To Borderline Catalyst Bank 1.	1.0	19.988	Refer to DTC P0420 in the DTC summary table. ⇒ page 244

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $35: Variable Valve Timing Monitor

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $35”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$80	P0011	Target Error Intake Bank 1.	-14.0 – 25.0°	-9.0 - 28.0°	Refer to DTC P0011 in the DTC summary table. ⇒ page 187
$81	P000A	Slow Response Intake Bank 1.	-14.0 – 25.0°	-9.0 - 28.0°	Refer to DTC P000A in the DTC summary table. ⇒ page 185

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $3B: Fuel Tank EVAP System Integrity / Leak Test (0.040" / 1.0 mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $3B”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$86	P0442	Fuel Tank Leak Test: Small Leak.	7,373.0	65,535.0	Refer to DTC P0442 in the DTC summary table. ⇒ page 247

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $3C: Fuel Tank EVAP System Integrity / Leak Test (0.020" / 0.5 mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $3C”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$84	P0456	Fuel Tank Leak Test: Very Small Leak.	0.0	0.170	Refer to DTC P0456 in the DTC summary table. ⇒ page 250

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $3D: EVAP Purge Flow Monitor

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $3D”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$8C	P0441	Purge Flow Monitor Valve Open.	0.0	836.0 – 2,786.0	Refer to DTC P0441 in the DTC summary table. ⇒ page 246
$8D	P0441	Purge Flow Monitor Valve Closed.	0.0	1,803.0 – 5,948.0	Refer to DTC P0441 in the DTC summary table. ⇒ page 246

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $41: Oxygen Sensor Heater Monitor Bank 1 – Sensor 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $41”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$85	P0135	Oxygen Sensor Ceramic Temperature Bank 1 Sensor 1 Monitoring.	715° C	6,513.5° C	Refer to DTC P0135 in the DTC summary table. ⇒ page 211

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $42: Oxygen Sensor Heater Monitor Bank 1 – Sensor 2

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $42”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0141	Oxygen Sensor Heating Internal Resistance Test Bank 1 Sensor 2.	0.0 Ω	20.4 kΩ	Refer to DTC P0141 in the DTC summary table. ⇒ page 219

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $43: Oxygen Sensor Heater Monitor Bank 1 – Sensor 3

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $43”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0147	Oxygen Sensor Heating Bank 1 Sensor 3 Internal Resistance Test.	0.0 Ω	32.4 kΩ	Refer to DTC P0147 in the DTC summary table. ⇒ page 226

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $71: Secondary Air Monitor

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $71”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$82	P0491	Blockage/Leakage Check Bank 1.	0.500	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 252
$84	P0491	Pressure Pulsation Check Bank 1.	0.148 kPa	32.767 kPa	Refer to DTC P0491 in the DTC summary table. ⇒ page 252
$85	P0410	Pressure Check Bank 1.	0.0 kPa	5,000.0 kPa	Refer to DTC P0410 in the DTC summary table. ⇒ page 242
$8A	P2240	Tightness Check Bank 1.	0.0	1.352	Refer to DTC P2440 in the DTC summary table. ⇒ page 295

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A2: Mis-Fire Cylinder 1 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A2”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0301	Cylinder 1 Data Averaged During Last 10 Drive Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 231
$0C	P0301	Cylinder 1 Data Averaged During Current Drive Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 231

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A3: Mis-Fire Cylinder 2 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A3”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0302	Misfire Cylinder 2, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 232
$0C	P0302	Misfire Cylinder 2, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 232

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A4: Mis-Fire Cylinder 3 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A4”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0303	Misfire Cylinder 3, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0303 in the DTC summary table. ⇒ page 233
$0C	P0303	Misfire Cylinder 3, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0303 in the DTC summary table. ⇒ page 233

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A5: Mis-Fire Cylinder 4 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A5”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0304	Misfire Cylinder 4, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0304 in the DTC summary table. ⇒ page 234
$0C	P0304	Misfire Cylinder 4, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0304 in the DTC summary table. ⇒ page 234

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A6: Mis-Fire Cylinder 5 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A6”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0305	Misfire Cylinder 5, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0305 in the DTC summary table. ⇒ page 236
$0C	P0305	Misfire Cylinder 5, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0305 in the DTC summary table. ⇒ page 236

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

3.3.8 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, 2012 MY

Diagnostic Mode 06 makes it possible to retrieve test results for special components and systems which are continuously or not continuously monitored. If the diagnosis of a system is complete, the diagnostic result and the corresponding thresholds are saved and displayed in mode 06. This data remains saved (even with the ignition off) until either new diagnostic results become available or the DTC memory is erased.

The min & max values for each individual test in Mode 06 represent the min & max operating values for a properly operating system. This data is provided to the individual aftermarket scan tool companies for development of their scan tool. Depending on the scan tool being used, the min & max values shown may vary, or be rounded up or down to the nearest decimal point depending on the aftermarket scan tool company's development process.

For example; GST manual documentation will show the value as 0.3499 (units) while the scan tool will display the same value as 0.35 (units).

Depending on the scan tool and protocol used, the information displayed in Diagnostic Mode 06 may be referred to by different names such as Test-ID (TID), Hex-ID, Component-ID (CID), On-Board Diagnostic Monitor Identifier (OBDMID), or contain no name at all and may be referenced by only a number.

Test requirements

- Exhaust system must be properly sealed between the catalytic converter and the cylinder heads.
- No DTCs stored in the DTC memory.
- Coolant temperature at least 80° C.

Work procedure

– Connect the scan tool.

– Start the engine and let run at idle speed.

– Select Diagnostic Mode 06: Check / test the results of components that are not continuously monitored.

Select the desired Test-ID.

The current minimum and maximum values will be displayed on the scan tool screen.

The following table is a numerical list of all “Test-IDs” that may be selected.

Monitor-ID	Component or System
$01: ⇒ page 43	Oxygen Sensor Monitor Bank 1 – Sensor 1
$02: ⇒ page 44	Oxygen Sensor Monitor Bank 1 – Sensor 2
$03: ⇒ page 44	Oxygen Sensor Monitor Bank 1 – Sensor 3
$21: ⇒ page 45	Catalytic Converter Monitoring
$35: ⇒ page 45	VVT Monitor Response Time/Target Error
$3B: ⇒ page 46	Fuel Tank EVAP System Integrity / Leak Test (0.040" / 1.0 mm)
$3C: ⇒ page 46	Fuel Tank EVAP System Integrity / Leak Test (0.020" / 0.5 mm)
$3D: ⇒ page 46	EVAP Purge Flow Monitor
$41: ⇒ page 47	Oxygen Sensor Heater Monitor Bank 1 – Sensor 1
$42: ⇒ page 47	Oxygen Sensor Heater Monitor Bank 1 – Sensor 2
$43: ⇒ page 48	Oxygen Sensor Heater Monitor Bank 1 – Sensor 3
$71: ⇒ page 48	Secondary Air Monitor
$A2: ⇒ page 49	Misfire Cylinder 1 Data
$A3: ⇒ page 49	Misfire Cylinder 2 Data
$A4: ⇒ page 50	Misfire Cylinder 3 Data
$A5: ⇒ page 50	Misfire Cylinder 4 Data
$A6: ⇒ page 51	Misfire Cylinder 5 Data

Monitor-ID $01: Oxygen Sensor Monitor Bank 1 – Sensor 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $01”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$83	P0133	Oxygen Sensor Signal Dynamic Bank 1 Sensor 1.	0.250	1.999	Refer to DTC P0133 in the DTC summary table. ⇒ page 326
$84	P2195	O2 Sensor Front/Rear Rationality Bank 1 Sensor 1.	- 0.070	0.070	Refer to DTC P2195 in the DTC summary table. ⇒ page 394
$84	P2196	O2 Sensor Front/Rear Rationality Bank 1 Sensor 1.	- 0.070	0.070	Refer to DTC P2196 in the DTC summary table. ⇒ page 395
$89	P0133	Oxygen Sensor Signal Dynamic Bank 1 Sensor 1.	0.250	1.999	Refer to DTC P0133 in the DTC summary table. ⇒ page 326

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault

Memory" to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory", page 21 .

– Switch the ignition off.

Monitor-ID $02: Oxygen Sensor Monitor Bank 1 – Sensor 2

– Connect the scan tool.

– Start the engine and run at idle.

– Select "Diagnostic Mode 06: Check / test the results of components that are not continuously monitored".

Select "Monitor-ID $02".

– Select the desired "Test-ID".

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P2271	Minimum Voltage Threshold From Rich To Lean.	0.0 V	0.8018 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 398
$82	P2270	Maximum Voltage Threshold From Lean To Rich.	0.5980 V	1.1306 V	Refer to DTC P2270 in the DTC summary table. ⇒ page 397
$8A	P2271	O2 Sensor Minimal Voltage Bank 1 Sensor 2.	0.0 V	0.1500 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 398
$05	P013 A	O2 Sensor Transient Time, Bank 1 Sensor 2.	0.0 ms	500.0 ms	Refer to DTC P013A in the DTC summary table. ⇒ page 332

– If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory", page 21 .

– Switch the ignition off.

Monitor-ID $03: Oxygen Sensor Monitor Bank 1 – Sensor 3

– Connect the scan tool.

– Start the engine and run at idle.

– Select "Diagnostic Mode 06: Check / test the results of components that are not continuously monitored".

Select "Monitor-ID $03".

– Select the desired "Test-ID".

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P2275	Minimum Sensor Voltage Of Oscillation Bank 1 Sensor 3.	0.0 V	0.8018 V	Refer to DTC P2275 in the DTC summary table. ⇒ page 401
$82	P2274	Maximum Sensor Voltage Of Oscillation Bank 1 Sensor 3.	0.5980 V	1.1306 V	Refer to DTC P2274 in the DTC summary table. ⇒ page 400
$8A	P2275	O2 Sensor Minimum Voltage Bank 1 Sensor 3.	0.0 V	0.1500 V	Refer to DTC P2275 in the DTC summary table. ⇒ page 401

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $21: Oxygen Storage Content of Catalyst

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $21”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$84	P0420	Oxygen Storage Content Value Of Catalyst.	100.0%	655.35%	Refer to DTC P0420 in the DTC summary table. ⇒ page 360

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $35: Variable Valve Timing Monitor

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $35”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$80	P0011	Target Error Intake Bank 1.	- 14.25	28.0	Refer to DTC P0011 in the DTC summary table. ⇒ page 303
$81	P000 A	Slow Response Intake Bank 1.	- 14.25	28.0	Refer to DTC P000A in the DTC summary table. ⇒ page 301

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $3B: Fuel Tank EVAP System Integrity / Leak Test (0.040" / 1.0 mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $3B”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$86	P0442	Fuel Tank Leak Test: Small Leak.	900.0 Pa	8,191.75 Pa	Refer to DTC P0442 in the DTC summary table. ⇒ page 363

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $3C: Fuel Tank EVAP System Integrity / Leak Test (0.020" / 0.5 mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $3C”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0456	Fuel Tank Leak Test: Very Small Leak.	5,800.0 ms	65,535.0 ms	Refer to DTC P0456 in the DTC summary table. ⇒ page 366
$82	---	EVAP Monitor System Ok By Initial Purge Check.	29.8 g	6,553.5 g	---
$84	P0456	Fuel Tank Leak Test: Very Small Leak (CBUA).	0.0	0.170	Refer to DTC P0456 in the DTC summary table. ⇒ page 366

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $3D: EVAP Purge Flow Monitor

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $3D”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$8C	P0496	Purge Flow Monitor Valve Open.	0.0 mA	17.6 mA	Refer to DTC P0496 in the DTC summary table. ⇒ page 369
$8D	P0441	Purge Flow Monitor Valve Closed.	0.0 mA	36.3 mA	Refer to DTC P0441 in the DTC summary table. ⇒ page 362

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $41: Oxygen Sensor Heater Monitor Bank 1 – Sensor 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $41”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$85	P0135	Oxygen Sensor Ceramic Temperature Bank 1 Sensor 1 Monitoring.	715° C	6,513.5° C	Refer to DTC P0135 in the DTC summary table. ⇒ page 327

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $42: Oxygen Sensor Heater Monitor Bank 1 – Sensor 2

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $42”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0141	Oxygen Sensor Heating Internal Resistance Test Bank 1 Sensor 2.	0.0 Ω	20.4 kΩ	Refer to DTC P0141 in the DTC summary table. ⇒ page 335

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $43: Oxygen Sensor Heater Monitor Bank 1 – Sensor 3

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $43”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0147	Oxygen Sensor Heating Bank 1 Sensor 3 Internal Resistance Test.	0.0 Ω	32.4 kΩ	Refer to DTC P0147 in the DTC summary table. ⇒ page 342

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $71: Secondary Air Monitor

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $71”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$82	P0491	Blockage/Leakage Check Bank 1.	0.500	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 368
$84	P0491	Pressure Pulsation Check Bank 1.	0.148 kPa	32.767 kPa	Refer to DTC P0491 in the DTC summary table. ⇒ page 368
$85	P0410	Pressure Check Bank 1.	0.0 kPa	5,000.0 kPa	Refer to DTC P0410 in the DTC summary table. ⇒ page 358

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$8A	P2240	Tightness Check Bank 1.	0.0	1.352	Refer to DTC P2440 in the DTC summary table. ⇒ page 412

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A2: Mis-Fire Cylinder 1 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A2”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0301	Cylinder 1 Data Averaged During Last 10 Drive Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 347
$0C	P0301	Cylinder 1 Data Averaged During Current Drive Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 347

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A3: Mis-Fire Cylinder 2 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A3”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0302	Misfire Cylinder 2, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 348
$0C	P0302	Misfire Cylinder 2, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 348

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A4: Mis-Fire Cylinder 3 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A4”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0303	Misfire Cylinder 3, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0303 in the DTC summary table. ⇒ page 349
$0C	P0303	Misfire Cylinder 3, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0303 in the DTC summary table. ⇒ page 349

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A5: Mis-Fire Cylinder 4 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A5”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0304	Misfire Cylinder 4, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0304 in the DTC summary table. ⇒ page 350
$0C	P0304	Misfire Cylinder 4, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0304 in the DTC summary table. ⇒ page 350

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding

diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory", page 21 .

– Switch the ignition off.

Monitor-ID $A6: Mis-Fire Cylinder 5 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select "Diagnostic Mode 06: Check / test the results of components that are not continuously monitored".

Select "Monitor-ID $A6".

– Select the desired "Test-ID".

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0305	Misfire Cylinder 5, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0305 in the DTC summary table. ⇒ page 352
$0C	P0305	Misfire Cylinder 5, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0305 in the DTC summary table. ⇒ page 352

– If any of the components or systems fail to meet the specified values, refer to Diagnostic "Mode 03: Interrogating Fault Memory" to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory", page 21 .

– Switch the ignition off.

3.3.9 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, 2013 MY

Diagnostic Mode 06 makes it possible to retrieve test results for special components and systems which are continuously or not continuously monitored. If the diagnosis of a system is complete, the diagnostic result and the corresponding thresholds are saved and displayed in mode 06. This data remains saved (even with the ignition off) until either new diagnostic results become available or the DTC memory is erased.

The min & max values for each individual test in Mode 06 represent the min & max operating values for a properly operating system. This data is provided to the individual aftermarket scan tool companies for development of their scan tool. Depending on the scan tool being used, the min & max values shown may vary, or be rounded up or down to the nearest decimal point depending on the aftermarket scan tool company's development process.

For example; GST manual documentation will show the value as 0.3499 (units) while the scan tool will display the same value as 0.35 (units).

Depending on the scan tool and protocol used, the information displayed in Diagnostic Mode 06 may be referred to by different names such as Test-ID (TID), Hex-ID, Component-ID (CID), On-Board Diagnostic Monitor Identifier (OBDMID), or contain no name at all and may be referenced by only a number.

Test requirements

- Exhaust system must be properly sealed between the catalytic converter and the cylinder heads.
- No DTCs stored in the DTC memory.
- Coolant temperature at least 80° C.

Work procedure

– Connect the scan tool.

– Start the engine and let run at idle speed.

– Select Diagnostic Mode 06: Check / test the results of components that are not continuously monitored.

Select the desired Test-ID.

The current minimum and maximum values will be displayed on the scan tool screen.

The following table is a numerical list of all “Test-IDs” that may be selected.

Monitor-ID	Component or System
$01: ⇒ page 52	Oxygen Sensor Monitor Bank 1 – Sensor 1
$02: ⇒ page 53	Oxygen Sensor Monitor Bank 1 – Sensor 2
$03: ⇒ page 53	Oxygen Sensor Monitor Bank 1 – Sensor 3
$21: ⇒ page 54	Catalytic Converter Monitoring
$35: ⇒ page 54	VVT Monitor Response Time/Target Error
$3B: ⇒ page 55	Fuel Tank EVAP System Integrity / Leak Test (0.040" / 1.0 mm)
$3C: ⇒ page 55	Fuel Tank EVAP System Integrity / Leak Test (0.020" / 0.5 mm)
$3D: ⇒ page 56	EVAP Purge Flow Monitor
$41: ⇒ page 56	Oxygen Sensor Heater Monitor Bank 1 – Sensor 1
$42: ⇒ page 57	Oxygen Sensor Heater Monitor Bank 1 – Sensor 2
$43: ⇒ page 57	Oxygen Sensor Heater Monitor Bank 1 – Sensor 3
$71: ⇒ page 58	Secondary Air Monitor
$A2: ⇒ page 58	Misfire Cylinder 1 Data
$A3: ⇒ page 59	Misfire Cylinder 2 Data
$A4: ⇒ page 59	Misfire Cylinder 3 Data
$A5: ⇒ page 59	Misfire Cylinder 4 Data
$A6: ⇒ page 60	Misfire Cylinder 5 Data

Monitor-ID $01: Oxygen Sensor Monitor Bank 1 – Sensor 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $01”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$83	P0133	Oxygen Sensor Signal Dynamic Bank 1 Sensor 1.	0.250	1.999	Refer to DTC P0133 in the DTC summary table. ⇒ page 443
$84	P2195	O2 Sensor Front/Rear Rationality Bank 1 Sensor 1.	- 0.070	0.070	Refer to DTC P2195 in the DTC summary table. ⇒ page 511
$84	P2196	O2 Sensor Front/Rear Rationality Bank 1 Sensor 1.	- 0.070	0.070	Refer to DTC P2196 in the DTC summary table. ⇒ page 512
$89	P0133	Oxygen Sensor Signal Dynamic Bank 1 Sensor 1.	0.250	1.999	Refer to DTC P0133 in the DTC summary table. ⇒ page 443

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $02: Oxygen Sensor Monitor Bank 1 – Sensor 2

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $02”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P2271	Minimum Voltage Threshold From Rich To Lean.	0.0 V	0.8018 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 515
$82	P2270	Maximum Voltage Threshold From Lean To Rich.	0.5980 V	1.1306 V	Refer to DTC P2270 in the DTC summary table. ⇒ page 514
$8A	P2271	O2 Sensor Minimal Voltage Bank 1 Sensor 2.	0.0 V	0.1500 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 515
$05	P013 A	O2 Sensor Transient Time, Bank 1 Sensor 2.	0.0 ms	500.0 ms	Refer to DTC P013A in the DTC summary table. ⇒ page 449

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $03: Oxygen Sensor Monitor Bank 1 – Sensor 3

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $03”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P2275	Minimum Sensor Voltage Of Oscillation Bank 1 Sensor 3.	0.0 V	0.8018 V	Refer to DTC P2275 in the DTC summary table. ⇒ page 518
$82	P2274	Maximum Sensor Voltage Of Oscillation Bank 1 Sensor 3.	0.5980 V	1.1306 V	Refer to DTC P2274 in the DTC summary table. ⇒ page 517
$8A	P2275	O2 Sensor Minimum Voltage Bank 1 Sensor 3.	0.0 V	0.1500 V	Refer to DTC P2275 in the DTC summary table. ⇒ page 518

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $21: Oxygen Storage Content of Catalyst

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $21”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$84	P0420	Oxygen Storage Content Value Of Catalyst.	100.0%	655.35%	Refer to DTC P0420 in the DTC summary table. ⇒ page 477

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $35: Variable Valve Timing Monitor

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $35”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$80	P0011	Target Error Intake Bank 1.	- 14.25	28.0	Refer to DTC P0011 in the DTC summary table. ⇒ page 420
$81	P000 A	Slow Response Intake Bank 1.	- 14.25	28.0	Refer to DTC P000A in the DTC summary table. ⇒ page 418

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $3B: Fuel Tank EVAP System Integrity / Leak Test (0.040" / 1.0 mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $3B”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$86	P0442	Fuel Tank Leak Test: Small Leak.	900.0 Pa	8,191.75 Pa	Refer to DTC P0442 in the DTC summary table. ⇒ page 480

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $3C: Fuel Tank EVAP System Integrity / Leak Test (0.020" / 0.5 mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $3C”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0456	Fuel Tank Leak Test: Very Small Leak.	5,800.0 ms	65,535.0 ms	Refer to DTC P0456 in the DTC summary table. ⇒ page 483

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$82	---	EVAP Monitor System Ok By Initial Purge Check.	29.8 g	6,553.5 g	---
$84	P0456	Fuel Tank Leak Test: Very Small Leak (CBUA).	0.0	0.170	Refer to DTC P0456 in the DTC summary table. ⇒ page 483

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $3D: EVAP Purge Flow Monitor

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $3D”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$8C	P0496	Purge Flow Monitor Valve Open.	0.0 mA	17.6 mA	Refer to DTC P0496 in the DTC summary table. ⇒ page 486
$8D	P0441	Purge Flow Monitor Valve Closed.	0.0 mA	36.3 mA	Refer to DTC P0441 in the DTC summary table. ⇒ page 479

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $41: Oxygen Sensor Heater Monitor Bank 1 – Sensor 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $41”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$85	P0135	Oxygen Sensor Ceramic Temperature Bank 1 Sensor 1 Monitoring.	715° C	6,513.5° C	Refer to DTC P0135 in the DTC summary table. ⇒ page 444

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $42: Oxygen Sensor Heater Monitor Bank 1 – Sensor 2

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $42”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0141	Oxygen Sensor Heating Internal Resistance Test Bank 1 Sensor 2.	0.0 Ω	20.4 kΩ	Refer to DTC P0141 in the DTC summary table. ⇒ page 452

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $43: Oxygen Sensor Heater Monitor Bank 1 – Sensor 3

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $43”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0147	Oxygen Sensor Heating Bank 1 Sensor 3 Internal Resistance Test.	0.0 Ω	32.4 kΩ	Refer to DTC P0147 in the DTC summary table. ⇒ page 459

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $71: Secondary Air Monitor

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $71”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$82	P0491	Blockage/Leakage Check Bank 1.	0.500	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 485
$84	P0491	Pressure Pulsation Check Bank 1.	0.148 kPa	32.767 kPa	Refer to DTC P0491 in the DTC summary table. ⇒ page 485
$85	P0410	Pressure Check Bank 1.	0.0 kPa	5,000.0 kPa	Refer to DTC P0410 in the DTC summary table. ⇒ page 475
$8A	P2240	Tightness Check Bank 1.	0.0	1.352	Refer to DTC P2440 in the DTC summary table. ⇒ page 529

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A2: Mis-Fire Cylinder 1 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A2”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0301	Cylinder 1 Data Averaged During Last 10 Drive Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 464
$0C	P0301	Cylinder 1 Data Averaged During Current Drive Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 464

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A3: Mis-Fire Cylinder 2 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A3”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0302	Misfire Cylinder 2, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 465
$0C	P0302	Misfire Cylinder 2, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 465

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A4: Mis-Fire Cylinder 3 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A4”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0303	Misfire Cylinder 3, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0303 in the DTC summary table. ⇒ page 466
$0C	P0303	Misfire Cylinder 3, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0303 in the DTC summary table. ⇒ page 466

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A5: Mis-Fire Cylinder 4 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A5”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0304	Misfire Cylinder 4, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0304 in the DTC summary table. ⇒ page 467
$0C	P0304	Misfire Cylinder 4, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0304 in the DTC summary table. ⇒ page 467

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A6: Mis-Fire Cylinder 5 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A6”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0305	Misfire Cylinder 5, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0305 in the DTC summary table. ⇒ page 469
$0C	P0305	Misfire Cylinder 5, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0305 in the DTC summary table. ⇒ page 469

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

3.3.10 Diagnostic Mode 06 – Read Test Results for Specific Diagnostic Functions, 2014 MY

Diagnostic Mode 06 makes it possible to retrieve test results for special components and systems which are continuously or not continuously monitored. If the diagnosis of a system is complete, the diagnostic result and the corresponding thresholds are saved and displayed in mode 06. This data remains saved

(even with the ignition off) until either new diagnostic results become available or the DTC memory is erased.

The min & max values for each individual test in Mode 06 represent the min & max operating values for a properly operating system. This data is provided to the individual aftermarket scan tool companies for development of their scan tool. Depending on the scan tool being used, the min & max values shown may vary, or be rounded up or down to the nearest decimal point depending on the aftermarket scan tool company's development process.

For example; GST manual documentation will show the value as 0.3499 (units) while the scan tool will display the same value as 0.35 (units).

Depending on the scan tool and protocol used, the information displayed in Diagnostic Mode 06 may be referred to by different names such as Test-ID (TID), Hex-ID, Component-ID (CID), On-Board Diagnostic Monitor Identifier (OBDMID), or contain no name at all and may be referenced by only a number.

Test requirements

- Exhaust system must be properly sealed between the catalytic converter and the cylinder heads.
- No DTCs stored in the DTC memory.
- Coolant temperature at least 80° C.

Work procedure

– Connect the scan tool.

– Start the engine and let run at idle speed.

– Select Diagnostic Mode 06: Check / test the results of components that are not continuously monitored.

Select the desired Test-ID.

The current minimum and maximum values will be displayed on the scan tool screen.

The following table is a numerical list of all “Test-IDs” that may be selected.

Monitor-ID	Component or System
$01: ⇒ page 62	Oxygen Sensor Monitor Bank 1 – Sensor 1
$02: ⇒ page 62	Oxygen Sensor Monitor Bank 1 – Sensor 2
$03: ⇒ page 63	Oxygen Sensor Monitor Bank 1 – Sensor 3
$21: ⇒ page 63	Catalytic Converter Monitoring
$35: ⇒ page 64	VVT Monitor Response Time/Target Error
$3B: ⇒ page 64	Fuel Tank EVAP System Integrity / Leak Test (0.040" / 1.0 mm)
$3C: ⇒ page 65	Fuel Tank EVAP System Integrity / Leak Test (0.020" / 0.5 mm)
$3D: ⇒ page 65	EVAP Purge Flow Monitor
$41: ⇒ page 66	Oxygen Sensor Heater Monitor Bank 1 – Sensor 1
$42: ⇒ page 66	Oxygen Sensor Heater Monitor Bank 1 – Sensor 2
$43: ⇒ page 66	Oxygen Sensor Heater Monitor Bank 1 – Sensor 3
$71: ⇒ page 67	Secondary Air Monitor
$A2: ⇒ page 67	Misfire Cylinder 1 Data
$A3: ⇒ page 68	Misfire Cylinder 2 Data
$A4: ⇒ page 68	Misfire Cylinder 3 Data

Monitor-ID	Component or System
$A5: ⇒ page 69	Misfire Cylinder 4 Data
$A6: ⇒ page 69	Misfire Cylinder 5 Data

Monitor-ID $01: Oxygen Sensor Monitor Bank 1 – Sensor 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $01”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$83	P0133	Oxygen Sensor Signal Dynamic Bank 1 Sensor 1.	0.250	1.999	Refer to DTC P0133 in the DTC summary table. ⇒ page 560
$84	P2195	O2 Sensor Front/Rear Rationality Bank 1 Sensor 1.	- 0.070	0.070	Refer to DTC P2195 in the DTC summary table. ⇒ page 629
$84	P2196	O2 Sensor Front/Rear Rationality Bank 1 Sensor 1.	- 0.070	0.070	Refer to DTC P2196 in the DTC summary table. ⇒ page 630
$89	P0133	Oxygen Sensor Signal Dynamic Bank 1 Sensor 1.	0.250	1.999	Refer to DTC P0133 in the DTC summary table. ⇒ page 560

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $02: Oxygen Sensor Monitor Bank 1 – Sensor 2

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $02”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P2271	Minimum Voltage Threshold From Rich To Lean.	0.0 V	0.8018 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 633
$82	P2270	Maximum Voltage Threshold From Lean To Rich.	0.5980 V	1.1306 V	Refer to DTC P2270 in the DTC summary table. ⇒ page 632

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$8A	P2271	O2 Sensor Minimal Voltage Bank 1 Sensor 2.	0.0 V	0.1500 V	Refer to DTC P2271 in the DTC summary table. ⇒ page 633
$05	P013 A	O2 Sensor Transient Time, Bank 1 Sensor 2.	0.0 ms	500.0 ms	Refer to DTC P013A in the DTC summary table. ⇒ page 566

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $03: Oxygen Sensor Monitor Bank 1 – Sensor 3

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $03”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P2275	Minimum Sensor Voltage Of Oscillation Bank 1 Sensor 3.	0.0 V	0.8018 V	Refer to DTC P2275 in the DTC summary table. ⇒ page 636
$82	P2274	Maximum Sensor Voltage Of Oscillation Bank 1 Sensor 3.	0.5980 V	1.1306 V	Refer to DTC P2274 in the DTC summary table. ⇒ page 635
$8A	P2275	O2 Sensor Minimum Voltage Bank 1 Sensor 3.	0.0 V	0.1500 V	Refer to DTC P2275 in the DTC summary table. ⇒ page 636

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $21: Oxygen Storage Content of Catalyst

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $21”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$84	P0420	Oxygen Storage Content Value Of Catalyst.	100.0%	655.35%	Refer to DTC P0420 in the DTC summary table. ⇒ page 595

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $35: Variable Valve Timing Monitor

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $35”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$80	P0011	Target Error Intake Bank 1.	- 14.25	28.0	Refer to DTC P0011 in the DTC summary table. ⇒ page 537
$81	P000A	Slow Response Intake Bank 1.	- 14.25	28.0	Refer to DTC P000A in the DTC summary table. ⇒ page 535

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $3B: Fuel Tank EVAP System Integrity / Leak Test (0.040" / 1.0 mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $3B”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$86	P0442	Fuel Tank Leak Test: Small Leak.	900.0 Pa	8,191.75 Pa	Refer to DTC P0442 in the DTC summary table. ⇒ page 598

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault

Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $3C: Fuel Tank EVAP System Integrity / Leak Test (0.020" / 0.5 mm)

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $3C”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0456	Fuel Tank Leak Test: Very Small Leak.	5,800.0 ms	65,535.0 ms	Refer to DTC P0456 in the DTC summary table. ⇒ page 601
$82	---	EVAP Monitor System Ok By Initial Purge Check.	29.8 g	6,553.5 g	---
$84	P0456	Fuel Tank Leak Test: Very Small Leak (CBUA).	0.0	0.170	Refer to DTC P0456 in the DTC summary table. ⇒ page 601

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $3D: EVAP Purge Flow Monitor

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $3D”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$8C	P0496	Purge Flow Monitor Valve Open.	0.0 mA	17.6 mA	Refer to DTC P0496 in the DTC summary table. ⇒ page 604
$8D	P0441	Purge Flow Monitor Valve Closed.	0.0 mA	36.3 mA	Refer to DTC P0441 in the DTC summary table. ⇒ page 597

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $41: Oxygen Sensor Heater Monitor Bank 1 – Sensor 1

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $41”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$85	P0135	Oxygen Sensor Ceramic Temperature Bank 1 Sensor 1 Monitoring.	715° C	6,513.5° C	Refer to DTC P0135 in the DTC summary table. ⇒ page 561

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $42: Oxygen Sensor Heater Monitor Bank 1 – Sensor 2

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $42”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0141	Oxygen Sensor Heating Internal Resistance Test Bank 1 Sensor 2.	0.0 Ω	20.4 kΩ	Refer to DTC P0141 in the DTC summary table. ⇒ page 569

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $43: Oxygen Sensor Heater Monitor Bank 1 – Sensor 3

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $43”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$81	P0147	Oxygen Sensor Heating Bank 1 Sensor 3 Internal Resistance Test.	0.0 Ω	32.4 kΩ	Refer to DTC P0147 in the DTC summary table. ⇒ page 576

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $71: Secondary Air Monitor

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $71”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$82	P0491	Blockage/Leakage Check Bank 1.	0.500	1.999	Refer to DTC P0491 in the DTC summary table. ⇒ page 603
$84	P0491	Pressure Pulsation Check Bank 1.	0.148 kPa	32.767 kPa	Refer to DTC P0491 in the DTC summary table. ⇒ page 603
$85	P0410	Pressure Check Bank 1.	0.0 kPa	5,000.0 kPa	Refer to DTC P0410 in the DTC summary table. ⇒ page 593
$8A	P2240	Tightness Check Bank 1.	0.0	1.352	Refer to DTC P2440 in the DTC summary table. ⇒ page 647

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A2: Mis-Fire Cylinder 1 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A2”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0301	Misfire Cylinder 1, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 582
$0C	P0301	Misfire Cylinder 1, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0301 in the DTC summary table. ⇒ page 582

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A3: Mis-Fire Cylinder 2 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A3”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0302	Misfire Cylinder 2, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 583
$0C	P0302	Misfire Cylinder 2, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0302 in the DTC summary table. ⇒ page 583

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A4: Mis-Fire Cylinder 3 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A4”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0303	Misfire Cylinder 3, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0303 in the DTC summary table. ⇒ page 584

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0C	P0303	Misfire Cylinder 3, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0303 in the DTC summary table. ⇒ page 584

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A5: Mis-Fire Cylinder 4 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A5”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0304	Misfire Cylinder 4, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0304 in the DTC summary table. ⇒ page 585
$0C	P0304	Misfire Cylinder 4, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0304 in the DTC summary table. ⇒ page 585

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

Monitor-ID $A6: Mis-Fire Cylinder 5 Data

– Connect the scan tool.

– Start the engine and run at idle.

– Select “Diagnostic Mode 06: Check / test the results of components that are not continuously monitored”.

Select “Monitor-ID $A6”.

– Select the desired “Test-ID”.

– Check specified values at idle.

Test-ID	DTC	Component or System	Min.	Max.	Additional Information
$0B	P0305	Misfire Cylinder 5, Average Value Over 10 Driving Cycles.	0.0 counts	65,535.0 counts	Refer to DTC P0305 in the DTC summary table. ⇒ page 586
$0C	P0305	Misfire Cylinder 5, In This Driving Cycle.	0.0 counts	65,535.0 counts	Refer to DTC P0305 in the DTC summary table. ⇒ page 586

– If any of the components or systems fail to meet the specified values, refer to Diagnostic “Mode 03: Interrogating Fault Memory” to check for stored DTCs or the corresponding diagnostic repair procedure ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 .

– Switch the ignition off.

3.3.11 Diagnostic Mode 07 – Read Faults Detected During the Current or Last Driving Cycle

Mode 07 makes it possible to check emissions-related faults which appeared during the current or last driving cycle (pending DTCs).

A pending DTC is saved the first time a fault is detected (output via Mode 07).

– If the fault is detected again by the end of the following driving cycle, a confirmed DTC is entered (output via Mode 03) and the MIL is activated.

– If this malfunction is not detected again by the end of the following driving cycle, the corresponding pending code will be deleted at the end of the driving cycle.

Note

Depending on scan tool and protocol used, some of the information provided may be referred to by a different name.

Procedure

– Connect the scan tool.

– Start the engine and run at idle.

Note

If the engine does not start, crank the engine using starter for at least 5 seconds. Do not switch the ignition off afterward.

– Select Diagnostic Mode 07: Check / test the results of components that are continuously monitored.

The number of pending DTCs or 0 malfunctions detected will be displayed on the scan tool screen.

– Refer to the DTC tables below for the diagnostic repair procedures.

♦ ⇒ E3.4.1 ngine/Motor Control Module, 2010 MY”, page 74
♦ ⇒ E3.4.2 ngine/Motor Control Module, 2011 MY”, page 185
♦ ⇒ E3.4.3 ngine/Motor Control Module, 2012 MY”, page 301
♦ ⇒ E3.4.4 ngine/Motor Control Module, 2013 MY”, page 418
♦ ⇒ E3.4.5 ngine/Motor Control Module, 2014 MY”, page 535

– Switch the ignition off.

3.3.12 Diagnostic Mode 08 – Request Control of On-Board System, Test or Component

Not supported on this vehicle

3.3.13 Diagnostic Mode 09 – Read Vehicle Information

Diagnostic Mode 09 makes it possible to access vehicle-specific information from the ECM and the TCM (where applicable).

Note

Depending on scan tool and protocol used, Diagnostic Mode 09 and the information provided may be referred to by a different name.

Test requirement

- No DTC's stored in the DTC memory.

Procedure

– Connect the scan tool.

– Switch the ignition on.

– Select “Diagnostic Mode 09: Vehicle information”.

– Select the desired “Test-ID”.

– The information requested will be displayed on the scan tool screen.

The following table is a numerical list of all “Test-IDs” that may be selected.

Test-ID	Diagnostic text
$02:	Vehicle identification number e.g.
	♦ A different 17 digit number will be displayed for each vehicle
$04:	Calibration identification e.g.
	♦ Engine/Motor Control Module
	♦ Transmission Control Module
$06:	Calibration verification number (check sum) e.g.
	♦ EC5AE460 the check sum is different for every control module version
$08:	In Use Performance Tracking (CBUA/SULEV only)
$0A:	ECU module acronym and text name

Service Mode $0A	SUPPORTED

– Switch the ignition off.

3.3.14 Diagnostic Mode 0A – Check Permanent DTC Memory

Note

- *The following is a generic explanation of the requirements, coverage, and operation of Mode 0A.*
- *Mode 0A may only be supported exclusively by OBD control modules in US vehicles. Mode 0A may not be supported in EOBD vehicles, meaning the control module may not send a response here.*

Mode 0A - Check Permanent DTC Memory (Request emissions-related diagnostic trouble codes with permanent status after code clear)

Permanent Fault Codes From MY 2010 with Phase-In conforming to CCR 1968.2 (d)(2.2.5): 50% from MY 2010 / 75% from MY 2011 / 100% from MY 2012 The vehicle only participates in Phase-In if all of the OBD-relevant control modules in the vehicle meet these requirements.

Mode 0A enables the request of all OBD-relevant faults with the status “Permanent Fault Code”

- Permanent Fault Codes are Confirmed Fault Codes that are currently activating the MIL. That means faults that are still displayed in Mode 03 but no longer activate the MIL (History Fault Codes) are not Permanent Fault Codes.

- Permanent Fault Codes are updated in Mode 0A at the same time as NVRAM storage immediately after switching the ignition off. A newly detected Permanent Fault Code is only visible after switching the ignition off/on in Mode 0A.

- Permanent Fault Codes may only be erased in the control module after they are corrected as long as the last diagnostic result was a PASS and the MIL is no longer activated by this fault. The Permanent Fault Codes should be erased from Mode 0A at the same time the MIL switches off when the ignition is switched off/on.

- Permanent Fault Codes may not be erased by clearing the DTC memory or disconnecting the power supply. Storage in NVRAM is required.

- Permanent Fault Codes may only be erased after clearing the DTC memory under the following conditions: - As long as no FAIL diagnostic result was detected for a Permanent Fault Code - and at least one PASS diagnostic result was detected - and the Minimum Trip Conditions for a General Denominator (without considering high/ambient temperature) were met in this phase in any DCY after erasing the DTC memory.

- The engine control module relays the message “Minimum Trip conditions met” to all other OBD control modules via CAN: CAN message OBD_01, Byte 8, Bit 4: OBD_Minimum_Trip

- Permanent Fault Codes may NOT be erased if the diagnostic result is FAIL after clearing the DTC memory. A Pending Fault Code should be stored and the DTC memory line should be overwritten with new Freeze Frame data. (Exception: If the Pending Fault Code is corrected without a Confirmed Fault Code being detected, the Permanent Fault Code may also be erased under the conditions described below.)

- Permanent Fault Codes should be erased in engine control modules after Update Programming. At this time, all readiness bits (Mode 01 PID $01) must be reset to “not complete” [(g)

(4.4.6)(D)]. Permanent Fault Codes should not be erased in OBD control modules with Comprehensive Components (CCM) as a single readiness bit if the identical program/data status is being programmed. If a different program/data status is being programmed, Permanent Fault Codes should be erased after Update Programming.

- The procedure in Mode 01 through Mode 09 and in the service tester is NOT affected by implementation of the Permanent Fault Codes.

Note

After MIL off during the 40 warm-up cycle self-healing process, the fault may not be reported as Permanent Fault Code anymore

Procedure

- ♦ Erasing Permanent Fault Codes after code clear Service $0A – Permanent Fault Codes: can only be erased at the end of a driving cycle (during ECM keep alive time) if all the following conditions are fulfilled:
- ♦ ERASE: Permanent Fault Codes after code clear, the vehicle needs to be driven!
- ♦ NO FAIL: DTC cleared
- ♦ MONITORS: PASS
- ♦ MINIMUM: Conditions fulfilled 600 s (cumulative) Engine running
- ♦ DRIVE: 300 s (cumulative) vehicle speed > 25 mph (40 km/h)

3.4 Engine DTC Tables

- ♦ ⇒ E3.4.1 ngine/Motor Control Module, 2010 MY”, page 74
- ♦ ⇒ E3.4.2 ngine/Motor Control Module, 2011 MY”, page 185
- ♦ ⇒ E3.4.3 ngine/Motor Control Module, 2012 MY”, page 301
- ♦ ⇒ E3.4.4 ngine/Motor Control Module, 2013 MY”, page 418
- ♦ ⇒ E3.4.5 ngine/Motor Control Module, 2014 MY”, page 535

3.4.1 Engine/Motor Control Module, 2010 MY

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P000A "A" Camshaft Position Slow Response Bank 1	VVT Actuator Intake Slow Response	• Difference between target position vs. actual position > 8 – 12° CRK (CBTA) • Difference between target position vs. actual position > 8° CRK (CBUA) • And • Adjustment angle > 3° CRK	• Time after engine start > 1.5 – 3.0 s • Engine speed 600 – 6,320 RPM • Oil temperature -48 – 143° C • Frequency (normal operation) 7.0 times [-] (CBTA) • Frequency (normal operation) 4.0 times [-] (CBUA) • Or (CBTA) • Frequency (CSM) 1.0 times [-] (CBTA)	• 21.0 (CBTA) • 12.0 s (CBUA) • Multiple	• 2 DCY	– Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0010 "A" Camshaft Position Actuator "A" Control Circuit/ Open Bank 1	VVT Actuator Intake Open Circuit	• Signal voltage > 4.40 – 5.60 V	• Camshaft valve off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0011 "A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	VVT Actuator Intake Target Error	• Difference between target position vs. actual position > 8 – 12° CRK (CBTA) • Difference between target position vs. actual position > 8° CRK (CBUA) • And • Adjustment angle > 3° CRK	• Time after engine start > 1.5 – 3.0 s • Engine speed 600 – 6,320 RPM • Oil temperature -48 – 143° C • Frequency (normal operation) 7.0 times [-] (CBTA) • Frequency (normal operation) 4.0 times [-] (CBUA) • Or (CBTA) • Frequency (CSM) 1.0 times [-] (CBTA)	• 21.0 (CBTA) • 12.0 s (CBUA) • Multiple	• 2 DCY	– Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0016 Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	Camshaft Position Sensor Inlet Angular Offset Check	• Permissible deviation < -13.5° CRK • Or • Permissible deviation > 13.5° CRK		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking”, page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking”, page 674 . – Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking”, page 672 .
P0030 HO2S Heater Control Circuit Bank 1 Sensor 1	Oxygen Sensors Heater Front Open Circuit	• Heater voltage 2.34 – 3.59 V	• Time after engine start > 5.0 s • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking”, page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0031 HO2S Heater Control Circuit Low Bank 1 Sensor 1	Oxygen Sensors Heater Front Short To Ground	• Heater voltage < 2.34 V	• Time after engine start > 5.0 s • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
P0032 HO2S Heater Control Circuit High Bank 1 Sensor 1	Oxygen Sensors Heater Front Short To Battery Plus	• Heater voltage > 3.59 V	• Time after engine start > 5.0 s • Heater commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0036 HO2S Heater Control Circuit Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Open Circuit	• Heater voltage 4.50 – 5.50 V	• Engine speed > 80 RPM (CBTA) • Time after engine start > 5.0 s (CBUA) • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0037 HO2S Heater Control Circuit Low Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Ground	• Heater voltage < 3.0 V	• Engine speed > 80 RPM (CBTA) • Time after engine start > 5.0 s (CBUA) • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0038 HO2S Heater Control Circuit High Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Battery Plus	• Heater current 2.70 – 5.50 A	• Engine speed > 80 RPM (CBTA) • Time after engine start > 5.0 s (CBUA) • Heater commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0042 HO2S Heater Control Circuit Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Open Circuit	• Heater voltage 4.50 – 5.50 V	• Engine speed > 80 RPM • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0043 HO2S Heater Control Circuit Low Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Ground	• Heater voltage < 3.0 V	• Engine speed > 80 RPM • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0044 HO2S Heater Control Circuit High Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Battery Plus	• Heater current 2.70 – 5.50 A	• Engine speed > 80 RPM • Heater commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .
P0070 Ambient Air Temperature Sensor Circuit "A"	Ambient Air Temperature Sensor Short To Battery / Open Circuit	• Ambient air temperature < -50° C	• CAN active	• 6.0 s • Multiple	• 2 DCY	– Check the Outside Air Temperature Sensor - G17-. Refer to ⇒ O3.6.21 utside Air Temperature Sensor G17, Checking", page 711 . – Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0071 Ambient Air Temperature Sensor Circuit "A" Range/ Performance	Ambient Air Temperature Sensor Range/ Performance	• Diff. ECT vs. IAT at engine start (depending on engine off time) < 24.75° C • And • Diff. IAT vs. AAT at engine start (depending on engine off time) > 24.75° C • And • Diff. AAT vs. ECT at engine start (depending on engine off time) > 24.75° C	• Engine off time > 6.0 h • Blockheater • ECT >= 143° C • Time after engine start 2.0 s • Or • Diff. ECT vs. ECT outlet <= 20° C • Time after engine start 2.0 s • Solar radiation case 1: • AAT @ start <= 2° C • Minus • AAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s • Solar radiation case 2: • IAT @ start <= 2° C • Minus • IAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s	• 60.0 s • Once / DCY	• 2 DCY	– Check the Outside Air Temperature Sensor - G17-. Refer to ⇒ "3.6.21 Outside Air Temperature Sensor G17, Checking", page 711 . – Check the CAN-Bus terminal resistance. Refer to ⇒ "3.6.4 CAN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0072 Ambient Air Temperature Sensor Circuit "A" Low	Ambient Air Temperature Sensor Short To Ground	• Ambient air temperature > 87° C	• CAN active	• 6.0 s • Multiple	• 2 DCY	– Check the Outside Air Temperature Sensor -G17-. Refer to ⇒ “3.6.21 Outside Air Temperature Sensor G17, Checking”, page 711 . – Check the CAN-Bus terminal resistance. Refer to ⇒ “3.6.4 CAN-Bus Terminal Resistance, Checking”, page 676 .
P0106 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Range/ Performance	Manifold Pressure Sensor Rationality Check Low	• Difference manifold pressure - lower threshold model < 0.0 hPa • Model range 0.0 – 800.0 hPa	• Time after engine start n.a.	• 450.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ “3.6.28 Throttle Valve Control Module GX3 / J338, Checking”, page 726 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ “3.6.15 Intake Manifold Sensor GX9, Checking”, page 698 .
	Manifold Pressure Sensor Rationality Check High	• Difference manifold pressure - lower threshold model > 0.0 hPa • Model range 650.0 – 1,080.0 hPa				
	Manifold Pressure Sensor Rationality Check	• Diff. altitude sensor signal vs. manifold pressure signal at engine start > 60.0 hPa	• Time after engine start < 25.0 s • Engine speed < 330 RPM			
	Manifold Pressure Sensor Adaptation Value Monitoring	• Offset value manifold pressure for load calculation in driving condition range 2.0 > 55.0 hPa	• Driving condition range 1 (omsna): • Engine speed < 800 RPM			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Offset value manifold pressure for load calculation in driving condition range 2.0 < -60.0 hPa	• Desired mass flow 5.0 – 25.0 kg/h • Delta adaptation value range 1.0 < 0.10 kg/h • For time 1.0 s • Driving condition range 2 (opsra): • Engine speed > 1,400 RPM • Manifold pressure < 425.0 hPa • Delta adaptation value range 2.0 < 2.97 hPa • For time 8.0 s • Driving condition range 3 (opua): • Desired mass flow > 40.0 kg/h • Manifold pressure > 550.0 hPa • Delta adaptation value range 3.0 < 2.97 hPa • For time 5.0 s • General: • Engine operation in every driving condition >= 2.0 times • Diagnosis evap purge system not active • Engine speed 500 – 6,000 RPM • Manifold pressure > 0.0 hPa • Ratio manifold pressure to ambient pressure < 0.85 [-]			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0107 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Low	Manifold Pressure Sensor Short To Ground	• Signal voltage < 0.20 V		• 1.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .
P0108 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit High	Manifold Pressure Sensor Short To Battery / Open Circuit	• Signal voltage > 4.86 V		• 1.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0111 Intake Air Temperature Sensor 1 Circuit Range/ Performance Bank 1	Intake Air Temperature Rationality Check	• Diff. ECT vs. IAT at engine start (depending on engine off time) > 24.75° C • And • Diff. IAT vs. AAT at engine start (depending on engine off time) > 24.75° C • And • Diff. AAT vs. ECT at engine start (depending on engine off time) < 24.75° C	• Engine off time > 6.0 h • Blockheater • ECT >= 143° C • Time after engine start 2.0 s • Or • Diff. ECT vs. ECT outlet <= 20° C • Time after engine start 2.0 s • Solar radiation case 1: • AAT @ start <= 2° C • Minus • AAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s • Solar radiation case 2: • IAT @ start <= 2° C • Minus • IAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s	• 60.0 s • Once / DCY	• 2 DCY	– Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 . – Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0112 Intake Air Temperature Sensor 1 Circuit Low Bank 1	Intake Air Temperature Sensor Short To Ground	• IAT > 130° C		• 5.0 s • Multiple	• 2 DCY	– Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 . – Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0113 Intake Air Temperature Sensor 1 Circuit High Bank 1	Intake Air Temperature Sensor Short To Battery / Open Circuit	• IAT < -46° C		• 5.0 s • Multiple	• 2 DCY	– Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 . – Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0116 Engine Coolant Temperature Sensor 1 Circuit Range/Performance	Engine Coolant Temperature Sensor Stuck Low	• Thres_01[f(ECT)]:Temp_01 • No change on signal 1.5 K	• ECT @ start n.a. • ECT 50 – 75° C • Cold start n.a. • Temp_02 • Substitute ECT > -45° C • Driving condition L: • Vehicle speed 0 – 20 km/h • Mass air flow 4.0 – 40.0 kg/h • Time required / > 10.0 s • Frequency 3.0 times • And • Driving condition H: • Vehicle speed 50 – 150 km/h • Mass air flow 32.0 – 352.0 kg/h • Time required / > 40.0 s • Frequency once	• 70.0 s • Once / DCY	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Engine Coolant Temperature Sensor Stuck High		• Temp_01 • ECT @ start n.a. • ECT 105 – 140° C • Cold start n.a. • Temp_02 • Substitute ECT > -45° C • Driving condition L: • Vehicle speed 0 – 20 km/h • Mass air flow 4.0 – 40.0 kg/h • Time required / > 10.0 s • Frequency 3.0 times • And • Driving condition H: • Vehicle speed 50 – 150 km/h • Mass air flow 32.0 – 352.0 kg/h • Time required / > 40.0 s • Frequency once			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Engine Coolant Temperature Sensor Stuck In Range	• Signal in range 75.0 – 105.0° C • And • No change on signal n.a.	• Cold start detected • Stuck high n.a. • Temp_01 • ECT @ start n.a. • Temp_02 • Substitute ECT n.a. • Driving condition L: • Vehicle speed n.a. • Mass air flow n.a. • time required / n.a. • Frequency n.a. • And • Driving condition H: • Vehicle speed n.a. • Mass air flow n.a. • Time required / n.a. • Frequency n.a.	• 2.0 s • Once / DCY		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0117 Engine Coolant Temperature Sensor 1 Circuit Low	Engine Coolant Temperature Sensor Short To Ground	• ECT > 140° C		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0118 Engine Coolant Temperature Sensor 1 Circuit High	Engine Coolant Temperature Sensor Short To Battery / Open Circuit	• ECT < -40° C		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.
P0121 Throttle/ Pedal Position Sensor/ Switch "A" Circuit Range/ Performance	Throttle Position Sensor 1 Rationality Check	• TPS1-TPS2 > 6.30% • And • • Actual TPS1 - calc. value > actual TPS2 - calc. value • Or • TPS1 - calc. value > 9.0%	• Engine speed > 480 RPM	• 0.3 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0122 Throttle/ Pedal Position Sensor/ Switch "A" Circuit Low	Throttle Position Sensor 1 Out Of Range Low	• Signal voltage < 0.20 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0123 Throttle/ Pedal Position Sensor/ Switch "A" Circuit High	Throttle Position Sensor 1 Out Of Range High	• Signal voltage > 4.81 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0130 O2 Sensor Circuit Bank 1 Sensor 1	Oxygen Sensors Front Out Of Range	• O2S ceramic temp. < 640° C	• Modeled exhaust temp > 300° C • Fuel cut off not active	• 15.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0131 O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	Oxygen Sensors Front Signal Range Check	• Short to ground • Virtual mass (VM) < 1.75 V • Or • Nernst voltage (UN) < 1.50 V • Or • Adjustment voltage (IA) < 0.30 V • Or • Adjustment voltage (IP) < 0.30 V		• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
P0132 O2 Sensor Circuit High Voltage Bank 1 Sensor 1	Oxygen Sensors Front Signal Range Check	• Short to battery • Virtual mass (VM) > 3.25 V • Or • Nernst voltage (UN) > 4.40 V • Or • Adjustment voltage (IA) > 7.0 V • Or • Adjustment voltage (IP) > 7.0 V		• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0133 O2 Sensor Circuit Slow Response Bank 1 Sensor 1	Oxygen Sensors Front Response Rate Monitoring, Area Ratio	• Symmetric fault: • Lower value of both area ratios R2L and L2R < 0.25 [-] (CBTA) • Lower value of both area ratios R2L and L2R < 0.20 [-] (CBUA) • And • Difference of R2L area ratio vs. L2R area ratio -0.40 – 0.40 [-] • Asymmetric fault: • Lower value of both area ratios R2L and L2R < 0.25 [-] (CBTA) • Lower value of both area ratios R2L and L2R < 0.35 [-] (CBUA) • And • Difference of R2L area ratio vs. L2R area ratio not (-0.40 – 0.40) [-] • General: • Lower value of both counters for area ratio R2L and L2R >= 5 times	• O2S front - min. operation temperature is reached > 720° C • O2S front - time since operation readiness > 40.0 s • Engine speed 1,160 – 2,720 RPM • Engine load 13.99 – 45.0% • Gradient of engine load <= 7.99% • Exhaust system lag time calculation 0.15 – 0.33 s • Gradient of exhaust system lag time calculation <= 0.0 s • ECT >= 10° C • Catalyst temperature >= 450° C • Lambda control set-point prior to diagnostic fuel steps A/F-ratio stoichiometric • Relative fuel amount from wall applied compensation and evap purge <= 0.1 [-] • Canister load < 15.0 [-] • Time since last measurement > 3.0 s • 2nd lambda control loop not active • Forced lambda oscillation not active • SAI not active • Tank leakage detection not active	• 67.0 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
			• Diagnosis evap purge system not active • Fuel cut off for any cylinders not active • Open circuit pump current (IP) ready • Only Flex fuel systems without ethanol sensor: • Ethanol concentration adaptation not active			
P0135 O2 Sensor Heater Circuit Bank 1 Sensor 1	Oxygen Sensors Heater Front Out Of Range High	• O2S ceramic temperature < 720° C • And • Heater duty cycle > 100.0%	• Modeled exhaust gas temp. > 550° C • Heater control active	• 70.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
	Oxygen Sensors Heater Front Rationality Check (Sensor Heating Up)	• O2S ceramic temp < 715° C • And • Time after O2S heater on 35.0 s	• ECT at start > -10° C • Engine shutoff time > 120.0 s • During ECM keep alive time (key off) < 500.0 s	• 35.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0136 O2 Sensor Circuit Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Heater Coupling Check)	• Delta voltage one step at heater switching > 2.0 V • And • Number of heater coupling >= 6.0 times [-]	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • For time > 10.0 s • Heater not active • For time > 0.0 s	• 60.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0137 O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Short To Ground, Core Connection Signal Wires)	• Signal voltage < 0.06 V • For time > 3.0 s • And • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) < 0.01 V	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time n.a. (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time n.a. (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • Fuel cut off not active • Catalyst purge not active	• 3.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0138 O2 Sensor Circuit High Voltage Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Out Of Range High (Short To Battery Plus)	• Signal voltage > 1.08 V • For time > 5.0 s	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • Lambda set value > 0.995 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0139 O2 Sensor Circuit Slow Response Bank 1 Sensor 2	Oxygen Sensors Rear (Binary LSF) Check Of Transient Time At Fuel Cut Off	• EWMA filtered transient time at fuel cut off > 0.6 s • O2 voltage between 201.0 – 401.0 mV • Number of checks (initial phase) >= 4.0 [-] • Number of checks (step function) >= 3.0 [-]	• Rich voltage (enable) >= 548.0 mV • Lean voltage n.a. • O2S rear ready • Rear O2 - sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131,070.0 Ω • Or • Trigger for step change: delta transient time > 0.3 s	• 4.5 s • Multiple	• 1 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0140 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Signal Line Open Circuit)	• Signal voltage 0.40 – 0.60 V • For time > 3.0 s • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3.0 measurements) >= 2.80 V	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded	• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Ground Line Open Circuit)	• Internal resistance > 40,000.0 Ω • And • Exhaust temperature > 670° C	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • Valid Ri-measurements > 10.0 times [-]	• 50.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0141 O2 Sensor Heater Circuit Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Out Of Range	• Heater resistance 1,200.0 – 32,400.0 Ω (CBTA) • Heater resistance 880.0 – 30,400.0 Ω (CBUA)	• Modeled exhaust gas temp. 200 – 680° C • Engine shut-off-time > 120.0 s • (During ECM keep alive-time after ignition off) < 500.0 s (CBTA) • (During ECM keep alive-time after ignition off) < 1,200.0 s (CBUA) • Number of checks 10.0 [-] • Fuel cut off not active • Heater commanded on	• 6.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0142 O2 Sensor Circuit Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Heater Coupling Check)	• Delta voltage one step at heater switching > 2.0 V • And • Number of heater coupling >= 6.0 times [-]	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • For time > 10.0 s • Heater not active • For time > 0.0 s	• 60.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0143 O2 Sensor Circuit Low Voltage Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Short To Ground, Core Connection Signal Wires)	• Signal voltage < 0.06 V • For time > 3.0 s • And • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3.0 measurements) < 0.01 [V]	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time n.a. • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time n.a. • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • Fuel cut off not active • Catalyst purge not active	• 3.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0144 O2 Sensor Circuit High Voltage Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Out Of Range High (Short To Battery Plus)	• Signal voltage > 1.08 V • For time > 5.0 s	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • Lambda set value > 0,995 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0145 O2 Sensor Circuit Slow Response Bank 1 Sensor 3	Oxygen Sensors Rear (Binary LSF) Check Of Transient Time At Fuel Cut Off	• EWMA filtered transient time at fuel cut off > 1.5 s • In voltage range 201.0 – 401.0 mV • Number of checks (initial phase) >= 4.0 [-] • Number of checks (step function) >= 3.0 [-]	• Rich voltage enable >= 548.0 mV • Lean voltage n.a. • O2S rear ready • Rear O2 - sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 - sensor internal resistance <= 131,070.0 Ω • Or • Trigger for step change: delta transient time > 0.3 s	• 4.5 s • Multiple	• 1 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0146 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Signal Line Open Circuit)	• Signal voltage 0.40 – 0.60 V • For time > 3.0 s • And • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3.0 measurements) >= 2.80 V	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded	• 5.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Ground Line Open Circuit)	• Internal resistance > 40,000.0 Ω • And • Exhaust temperature > 670° C	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • Valid Ri-measurements > 10.0 times [-]	• 50.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0147 O2 Sensor Heater Circuit Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Out Of Range	• Heater resistance 1,200.0 – 32,400.0 Ω	• Modeled exhaust gas temp. 200 – 680° C • Engine shut-off-time > 120.0 s • (During ECM keep alive-time after ignition off) < 500.0 s • Number of checks 10.0 [-] • Fuel cut off not active • Heater commanded on	• 6.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .
P0169 Incorrect Fuel Composition	ECM: EGAS Module Function Monitoring: Injection Time	• Comparison with fuel quantity incorrect	• Internal engine speed > 1,200 RPM	• 0.5 s • Continuous	• 2 DCY	– Check for contaminated/aged fuel or possible high concentration of alcohol in fuel (above 15%). Poor quality fuel will also increase consumption. Replace with fresh fuel if believed to be contaminated. Refer to appropriate repair manual. – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒
	ECM: EGAS Module Function Monitoring: Lambda Mode	• Internal check failed				
	ECM: EGAS Module Function Monitoring: Mixture Control	• Correction factor incorrect				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Fuel quantity incorrect				O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – If fuel quality is adequate, replace the Engine/ Motor Control Module. Refer to appropriate repair manual.
P0201 Cylinder 1 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0202 Cylinder 2 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0203 Cylinder 3 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0204 Cylinder 4 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0205 Cylinder 5 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0221 Throttle/ Pedal Position Sensor/ Switch "B" Circuit Range/ Performance	Throttle Position Sensor 2 Rationality Check	• TPS1 - TPS2 > 6.30% • And • • Actual TPS2 - calc. value > actual TPS1 - calc. value • or • TPS2 - calc. value > 9.0%	• Engine speed > 480 RPM	• 0.3 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0222 Throttle/ Pedal Position Sensor/ Switch "B" Circuit Low	Throttle Position Sensor 2 Out Of Range Low	• Signal voltage < 0.20 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0223 Throttle/ Pedal Position Sensor/ Switch "B" Circuit High	Throttle Position Sensor 2 Out Of Range High	• Signal voltage > 4.81 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0261 Cylinder 1 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0262 Cylinder 1 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0264 Cylinder 2 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0265 Cylinder 2 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0267 Cylinder 3 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0268 Cylinder 3 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0270 Cylinder 4 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0271 Cylinder 4 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0273 Cylinder 5 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0274 Cylinder 5 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0300 Random/ Multiple Cylinder Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0301 Cylinder 1 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system me-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	chanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0302 Cylinder 2 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low com-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	pression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0303 Cylinder 3 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)	• Rough road not detected	• 200 rev • Multiple	• Immediately	cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking”, page 696 .
P0304 Cylinder 4 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)	• Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 200 rev • Multiple	• Immediately	visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						Stage, Checking", page 696 .
P0305 Cylinder 5 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0321 Ignition/ Distributor Engine Speed Input Circuit Range/ Performance	RPM Sensor Rationality Check	• Counted teeth vs. reference incorrect • Or • Monitoring reference gap failure		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 .
P0322 Ignition/ Distributor Engine Speed Input Circuit No Signal	RPM Sensor Signal Activity Check	• Camshaft signals > 5.0 [-] • And • Engine speed no signal		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0324 Knock / Combustion Vibration Control System Error	Knock Control Internal Hardware Check	• Signal fault counter (combustion) > 30.0 [-] • Or • Signal fault counter (measuring window) > 2.0 [-]	• Engine speed > 2,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 -G61-. Refer to ⇒ K3.6.16 nock Sensor 1 G61, Checking”, page 700 . – Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking”, page 702 .
P0327 Knock / Combustion Vibration Sensor 1 Circuit Low Bank 1 or Single Sensor	Knock Sensor Short To Ground Port A Knock Sensor Short To Ground Port B	• Lower threshold < -0.70 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 -G61-. Refer to ⇒ K3.6.16 nock Sensor 1 G61, Checking”, page 700 . – Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking”, page 702 .
	Knock Sensor Signal Range Check	• Lower threshold < 1.4 – 5.6 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		
P0328 Knock / Combustion Vibration Sensor 1 Circuit High Bank 1 or Single Sensor	Knock Sensor Short To Battery Plus Port A Knock Sensor Short To Battery Plus Port B	• Upper threshold > 1.0 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 -G61-. Refer to ⇒ K3.6.16 nock Sensor 1 G61, Checking”, page 700 . – Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking”, page 702 .
	Knock Sensor Signal Range Check	• Upper threshold > 23.0 – 92.0 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0332 Knock / Combustion Vibration Sensor 2 Circuit Low Bank 2	Knock Sensor Short To Ground Port A	• Lower threshold < - 0.70 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 noc k Sensor 2 G66, Checking”, page 702 .
	Knock Sensor Short To Ground Port B					
	Knock Sensor Signal Range Check	• Lower threshold < 1.4 – 5.6 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		
P0333 Knock / Combustion Vibration Sensor 2 Circuit High Bank 2	Knock Sensor Short To Battery Plus Port A	• Upper threshold > 1.0 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 noc k Sensor 2 G66, Checking”, page 702 .
	Knock Sensor Short To Battery Plus Port B					
	Knock Sensor Signal Range Check	• Upper threshold > 23.0 – 92.0 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		
P0341 Camshaft Position Sensor "A" Circuit Range/ Performance Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	• Signal pattern incorrect		• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking”, page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking”, page 686 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0342 Camshaft Position Sensor "A" Circuit Low Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	• Signal voltage permanently low • Crankshaft signal 8.0 [-]		• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 .
P0343 Camshaft Position Sensor "A" Circuit High Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	• Signal voltage permanently high • Crankshaft signal 8.0 [-]		• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 .
P0351 Ignition Coil "A" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0352 Ignition Coil "B" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0353 Ignition Coil "C" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0354 Ignition Coil "D" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0355 Ignition Coil "E" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0410 AIR System "A"	Air System Check After SAI	• Deviation SAI pressure > 50.0 hPa	• Mass airflow 7.0 – 120.0 kg/h • Delta engine load -10.0 – 10.0%/rev • ECT 5 – 108° C • IAT 5 – 100° C • Altitude < 2,700.0 m • SAI pressure sensor ready	• 6.0 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 . – Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .
P0413 AIR System Switching Valve "A" Circuit Open	Air Valve Open Circuit	• Signal voltage 9.25 – 11.25 V	• Air valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve -N112-. Refer to ⇒ S3.6.26 econdary Air Injection Solenoid Valve N112, Checking", page 723 .
P0414 AIR System Switching Valve "A" Circuit Shorted	Air Valve Short To Ground	• Signal voltage < 6.0 V	• Air valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve -N112-. Refer to ⇒ S3.6.26 econdary Air Injection Solenoid Valve N112,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Air Valve Short To Battery Plus	• Signal current 2.20 – 4.20 A	• Air valve commanded on • Engine speed > 80 RPM			Checking”, page 723 .
P0418 AIR System Control "A" Circuit	Air Pump Relay Open Circuit	• Signal voltage 4.50 – 5.50 V	• Pump relay commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking”, page 719 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0420 Catalyst System Efficiency Below Threshold Bank 1	Catalyst System Measure Of OSC Compared To OSC Of Borderline Catalyst	• Measured OSC / OSC of borderline catalyst measured OSC (HC and NOx-correlated) < 1.0 [-]	• Time after engine start > 343.0 s • Or • Time after dew point > 343.0 s • Delta exhaust mass flow < 25.0 kg/h • Exhaust gas mass flow, lower range 25.0 – 130.0 kg/h (CBUA) • Exhaust gas mass flow, lower range 25.0 – 120.0 kg/h (CBTA) • Exhaust gas mass flow, upper range n.a. • Modeled exhaust gas temp. dynamic < 50 K • Modeled exhaust gas temp. in catalyst system, lower range 500 – 860° C (CBUA) • Modeled exhaust gas temp. in catalyst system, lower range 560 – 860° C (CBTA) • Modeled exhaust gas temp. in catalyst system, upper range n.a. • Minimum modeled exhaust gas temp. in catalyst system > 400° C • For time > 120.0 s • Filtered minimum modeled exhaust gas temp. in catalyst system > 450° C • Engine load 12.8 – 65.3% (CBUA) • Engine load 12.8 – 60.0% (CBTA)	• 40.0 s (CBUA) • 30.0 s (CBTA) • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Three Way Catalytic Converter (TWC). Refer to ⇒ T3.6.27 hree Way Catalytic Converter (TWC), Checking", page 725 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
			• Evap purge loading not high • Engine speed 1,200 – 3,320 RPM • Range between lambda set value and lambda value < 0.02 [-] • Out of lambda range < 2.0 s • Lambda control closed loop • Lambda control not at min or max limit • Number of checks 3.0 [-] • O2S front ready • O2S rear ready • SAS not active • No misfire • O2S front response monitoring in current driving cycle ready			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0441 EVAP System Incorrect Purge Flow	EVAP System Functional Check	• Deviation lambda control < 9.0% • And • Deviation idle control < 40.0%	• Time after engine start n.a. • Engine speed idle • Engine speed deviation < 100 RPM • ECT > 60° C • Or • Substitute ECT > 80° C • IAT > 5° C • Altitude < 2,700.0 m • Lambda control closed loop	• 20.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks", page 7 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0442 EVAP System Leak Detected (Small Leak)	EVAP System Small Leak Pressure Check	• Time for pressure drop < 1.9 s	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Air temperature drop after engine start < 5 K • Intake manifold vacuum > -2,560.0 hPa • Altitude < 2,700.0 m • Vehicle speed >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Restart temperature difference > 52 K • Evap purge valve closed • LDP active • Deep down hill driving • Delta ambient pressure < 7.03 hPa • Or • Engine load not < 19.5 – 45.0% • And • Delta vehicle speed not > -1 km/h	• 180.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks", page 7 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0444 EVAP System Purge Control Valve "A" Circuit Open	EVAP Purge Valve Open Circuit	• Signal voltage > 4.40 – 5.40 V	• EVAP purge valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0455 EVAP System Leak Detected - Large Leak	EVAP System Large Leak Pressure Check	• Time for pressure drop < 0.95 s .	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Air temperature drop after engine start < 8 K • Intake manifold vacuum > -2,560.0 hPa • Altitude < 2,700.0 m • Vehicle speed >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Restart temperature difference > 52 K • Evap purge valve closed • LDP active • Deep down hill driving • Delta ambient pressure < 7.03 hPa • Or • Engine load not < 19.5 – 45.0% • And • Delta vehicle speed not >= -1 km/h	• 180.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks", page 7 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0456 EVAP System Leak Detected (Very Small Leak)	EVAP System Very Small Leak Pressure Check	• Time for pressure drop < 5.8 s	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Air temperature drop after engine start < 3 K • Intake manifold vacuum > -2,560.0 hPa • Altitude < 2,700.0 m • Vehicle speed 0 – 140 od. >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Restart temperature difference > 52 K • Evap purge valve closed • LDP active • Hill driving • Delta ambient pressure -8.0 – 2.0 hPa • Or • Engine load not < 19.5 – 45.0% • And • Delta vehicle speed not >= -1 km/h • Additional: • Vehicle acceleration < 3.80 m/s2 • Delta engine load < 767.98%/seg	• 180.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks”, page 7 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking”, page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)”, page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)”, page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0458 EVAP System Purge Control Valve "A" Circuit Low	EVAP Purge Valve Short To Ground	• Signal voltage < 2.15 – 3.25 V	• EVAP purge valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 .
P0459 EVAP System Purge Control Valve "A" Circuit High	EVAP Purge Valve Short To Battery Plus	• Signal current > 2.2 A	• EVAP purge valve commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0491 AIR System Insufficient Flow Bank 1	Air System Flow Check During Catalyst Heating	• SAI pressure measured with SAI pressure sensor vs. modeled < 50.0 – 72.0% • Or • Absolute deviation of raw pressure signal from filtered signal: mean value < 1.5 – 9.0 hPa	• Mass air flow 7.0 – 120.0 kg/h • Delta engine load -10.0 – 10.0%/rev • ECT 5 – 108° C • IAT 5 – 100° C • Altitude < 2,700.0 m • SAI pressure sensor ready	• 45.0 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 . – Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .
P0501 Vehicle Speed Sensor "A" Circuit Range/ Performance	Vehicle Speed Plausibility Check	• Vehicle speed < 6 km/h	• Engine speed > 2,800 RPM • Engine torque > 120.0 Nm • Vehicle speed sensor no fault	• 10.5 s • Multiple	• 2 DCY	– Check the vehicle speed signal. Refer to ⇒ V3.6.29 ehicle Speed Signal, Checking", page 729 . – Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0506 Idle Control System RPM - Lower Than Expected	Idle Controller Out Of Range Low	• Engine speed deviation < -100 RPM • And • RPM controller torque value >= calculated max value.	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT > -48 °C • IAT > -48 °C • Vehicle speed ready • Evap purge valve closed • External torque request not demanded • For manual transmission: • Engine load < 34.5%	• 7.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0507 Idle Control System RPM - Higher Than Expected	Idle Controller Out Of Range High	• Engine speed deviation > 100 RPM • And • RPM controller torque value <= calculated min. value • Or • RPM controller P-portion and I-portion < -20.0 Nm	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT > -48 °C • IAT > -48 °C • Vehicle speed ready • Evap purge valve closed • External torque request not demanded	• 7.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P050A Cold Start Idle Control System Performance	Cold Start Monitoring Idle Controller Out of Range Low	• Engine speed deviation < -100 RPM • And • RPM controller torque value >= calculated max. value	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT @ start < 143° C • IAT > -48° C • EVAP purge valve closed • External torque request not demanded • Catalyst heating active • For manual transmission: • Engine load < 34.5%	• 5.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
	Cold Start Monitoring Idle Controller Out of Range High	• Engine speed deviation > 100 RPM • RPM controller torque value <= calculated min. value • RPM controller P-portion and I-portion < -20.0 Nm	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT @ start < 143° C • IAT > -48° C • EVAP purge valve closed • External torque request not demanded • Catalyst heating active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P052A Cold Start "A" Camshaft Position Timing Over-Advanced Bank 1	Cold Start Monitoring VVT Actuator Intake Target Error	• Difference between target position vs. actual position > 10° CRK	• Time after engine start >= 10.0 s • Engine speed >= 400 RPM • Modeled oil temperature >= -48° C • Catalyst heating active	• 5.0 s • Once / DCY	• 2 DCY	– Check engine oil for incorrect viscosity or in need of servicing (dirty oil). Oil that is not clear in color may be causing the sensor to operate incorrectly. The engine oil must be clean and of the correct viscosity in order for the sensor to operate properly. Check the vehicle paperwork to determine what oil viscosity has been used and when the last oil change was performed. Change the engine oil if necessary. – Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 .
P0606 ECM/PCM Processor	Oxygen Sensors Heater Front Out Of Range	• Difference between measured calibration resistance in ECM and set value > 45.0 Ω	• Time after engine start > 40.0 s • Engine speed idle	• 40.0 s • Multiple	• 2 DCY	– Replace the Engine/Motor Control Module -J623-. Refer to appropriate repair manual.
	Altitude Sensor Plausibility Check	• Signal gradient > 50.0 hPa		• 20.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Signal gradient < -50.0 hPa				
	Altitude Sensor Short To Ground	• Signal voltage < 0.20 V		• 0.2 s • Multiple		
	Altitude Sensor Short To Battery / Open Circuit	• Signal voltage > 4.88 V				
	ECM: WDA Function Monitoring: WDA	• General cause failure		• 0.5 s • Continuous		
		• Internal check failure				
		• Overvoltage detection failure				
	ECM: EEPROM Check	• Check failed				
	ECM: Self Check For Sensor IC internal Hardware Check (Electrical Adjustment Communication, Voltage Supply)	• Check				
	ECM: 5V Supply Voltage Internal Hardware Check	• Under-/overvoltage detection				
	ECM: A/D Converter Power-Up Calibration	• Check failed	• Initialization phase active			
	ECM: A/D Converter Adc-Cannel Conversion		• Initialization phase active • Power-up calibration executed			
	ECM: EGAS Module Function Monitoring: A/D Converter	• Comparison reference voltage with sensor voltage incorrect				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Test voltage check failed				
		• Internal check failed				
	ECM: EGAS Module Function Monitoring: Torque	• Comparison with allowed engine torque incorrect	• Internal engine speed > 600 RPM			
	ECM: EGAS Module Function Monitoring: Engine Speed Deviation	• Difference between calculated and internal engine speed > 320 RPM	• Internal engine speed > 520 RPM			
	ECM: EGAS Module Function Monitoring: Coding	• Internal check failed				
	ECM: EGAS Module Function Monitoring: Ignition Timing					
	ECM: EGAS Module Function Monitoring: Intern	• System reaction incorrect				
	ECM: EGAS Module Function Monitoring: Injection Rate Limitation					
	ECM: EGAS Module Function Monitoring: Accelerator Position	• Internal check failed				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	ECM: EGAS Module Monitoring Module	• Function controller check failed • And • Monitoring module check no failure	• SPI - interface no failure			
	CAN: Internal Fault CAN Controller RAM Check	• RAM error memory checksum error	• Initialization phase • Time after ignition on 500.0 ms	• 0.0 ms • Once / DCY		
P0627 Fuel Pump "A" Control Circuit/ Open	Fuel Pump Relay Open Circuit	• Signal voltage 4.50 – 5.50 V	• Pump relay commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 .
	Fuel Pump Relay Short To Ground	• Signal voltage < 3.0 V				
P0629 Fuel Pump "A" Control Circuit High	Fuel Pump Relay Short To Battery Plus	• Signal current 0.60 – 1.20 A	• Pump relay commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0638 Throttle Actuator Control Range/ Performance Bank 1	Throttle Actuator Basic Settings Rationality Check Close Movement	• Time to close to reference point > 0.6 s • And • Reference point 2.88%	• Engine speed 0 RPM • Vehicle speed 0 km/h • ECT > -20° C • IAT > -20° C • Case 1: • Ignition on • Case 2: • Engine shut-off-time 3.0 s • Number of checks 2.0 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
	Throttle Actuator Basic Settings Signal Range Check @ Mechanical Stop Low	• TPS 1 signal voltage not (0.40 – 0.80) V • Or • TPS 2 signal voltage not (4.20 – 4.60) V • Or • TPS1 + TPS2 not (4.82 – 5.18) V	• Engine speed 0 RPM • Vehicle speed 0 km/h • Case 1: • Ignition on • ECT -20 – 115° C • IAT -20 – 143° C • Case 2: • Engine shut-off-time 3.0 s • ECT 5 – 115° C • IAT 5 – 143° C	• 0.3 s • Multiple		
P0641 Sensor Reference Voltage "A" Circuit/ Open	ECM: Sensor Reference Circuit A Signal Range Check	• Signal voltage deviation > +/- 0.3 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/ Motor Control Module -J623-. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0651 Sensor Reference Voltage "B" Circuit/ Open	ECM: Sensor Reference Circuit B Signal Range Check	• Signal voltage deviation > +/- 0.3 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/ Motor Control Module -J623-. Refer to appropriate repair manual.
P0697 Sensor Reference Voltage "C" Circuit/ Open	ECM: Sensor Reference Circuit C Signal Range Check	• Signal voltage deviation > +/- 0.3 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/ Motor Control Module -J623-. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P117A Bank 1, Oxygen Sensor Correction Center Sensor Control Limit Reached	Fuel System Out Of Range	• I - portion of 3rd lambda control loop > 0.03 [-]	• Engine speed 1,400 – 3,600 RPM • Modeled exhaust gas temp 350 – 1,000° C • Engine load 20.3 – 54.8% • Lambda control closed loop • 2nd lambda control closed loop • 3rd lambda control closed loop • O2S rear ready • Electrical check ready • O2S heater rear ready no fault	• 1,800.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .
P150A Engine Off Timer Performance	Engine-Off-Time Comparison Of Engine Off Time From Instrument Cluster Control Unit With Engine After Run Time	• Difference between engine-off-time and ECM after-run time < -12.0 s	• Key on after ECM after run time active • CAN active	• 6.0 s • Once / DCY	• 2 DCY	– If ignition off B+ is lost to ECM, this code will set. Check power and ground inputs to ECM first. Refer to Wiring Diagrams for pin locations. If all power/ grounds to ECM are

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Difference between engine-off-time and ECM after-run time > 12.0 s	• Key on during ECM after run time active • CAN active			present, replace the Engine/ Motor Control Module - J623-. Refer to appropriate repair manual.
P2088 "A" Camshaft Position Actuator Control Circuit Low Bank 1	VVT Actuator Intake Short To Ground	• Signal voltage < 2.15 – 3.25 V	• Camshaft valve off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor - G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Camshaft Adjustment Valve 1 - N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 .
P2089 "A" Camshaft Position Actuator Control Circuit High Bank 1	VVT Actuator Intake Short To Battery Plus	• Signal current > 2.2 A	• Camshaft valve on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor - G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Camshaft Adjustment Valve 1 - N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2096 Post Catalyst Fuel Trim System Too Lean Bank 1	Fuel System Out Of Range	• I-portion of 2nd lambda control loop < -0.040 [-] (CBTA) • I-portion of 2nd lambda control loop < -0.030 [-] (CBUA)	• Modeled exhaust gas temp. 400 – 1,000° C • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • Lambda control not at min or max limit • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front active • O2S heater rear active • Fuel cut off not active • Catalyst heating not active • SAI not active	• 140.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2097 Post Catalyst Fuel Trim System Too Rich Bank 1	Fuel System Out Of Range	• I-portion of 2nd lambda control loop > 0.040 [-] (CBTA) • I-portion of 2nd lambda control loop > 0.030 [-] (CBUA)	• Modeled exhaust gas temp. 400 – 1,000° C • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • Lambda control not at min or max limit • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front active • O2S heater rear active • Fuel cut off not active • Catalyst heating not active • SAI not active	• 140.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .
P2101 Throttle Actuator "A" Control Motor Circuit Range/ Performance	Throttle Actuator Rationality Check	• Deviation throttle value angles vs calculated value > 4.0 – 50.0%		• 0.5 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
	Throttle Actuator Signal Range Check	• Duty cycle > 80.0% • And • ECM power stage no failure		• 5.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2106 Throttle Actuator Control System - Forced Limited Power	Throttle Actuator Open Circuit	• Internal check	• Duty cycle > 80.0% • Or • Deviation throttle value angle vs. calculated value > 4.0 – 50.0%	• 12.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking”, page 726 .
	Throttle Actuator Functional Check	• Internal check failed				
	Throttle Actuator Temperature / Current Monitoring					
	Throttle Actuator Short To Battery Plus / Short To Ground	• Internal check				
P2122 Throttle/ Pedal Position Sensor/ Switch "D" Circuit Low	Accelerator Position Sensor 1 Out Of Range Low	• Signal voltage < 0.6 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking”, page 670 .
P2123 Throttle/ Pedal Position Sensor/ Switch "D" Circuit High	Accelerator Position Sensor 1 Out Of Range High	• Signal voltage > 4.8 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking”, page 670 .
P2127 Throttle/ Pedal Position Sensor/ Switch "E" Circuit Low	Accelerator Position Sensor 2 Out Of Range Low	• Signal voltage < 0.3 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking”, page 670 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2128 Throttle/ Pedal Position Sensor/ Switch "E" Circuit High	Accelerator Position Sensor 2 Out Of Range High	• Signal voltage > 2.4 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .
P2138 Throttle/ Pedal Position Sensor/ Switch "D"/"E" Voltage Correlation	Accelerator Position Sensor 1 And 2 Rationality Check	• Signal voltage sensor 1 vs. 2 > 0.167 – 0.703 V	• Signal voltage sensor 1 > 445.0 mV • Signal voltage sensor 2 > 445.0 mV	• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2177 System Too Lean Off Idle Bank 1	Fuel System Too Lean @ Part Load	• Adaptive value > 28.0%	• Time after engine start n.a. • Engine speed 1,320 – 4,600 RPM • Engine load 25.0 – 46.0% • Mass air flow 45.0 – 300.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Lambda control closed loop • Evap purge valve closed • If low fuel signal then wait until fuel consumption n.a.	• 25.0 s • Multiple	• 2 DCY	– Check the vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking”, page 716 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2178 System Too Rich Off Idle Bank 1	Fuel System Too Rich @ Part Load	• Adaptive value < -28.0%	• Time after engine start n.a. • Engine speed 1,320 – 4,600 RPM • Engine load 25.0 – 46.0% • Mass air flow 45.0 – 300.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Lambda control closed loop • Evap purge valve closed	• 25.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking”, page 716 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking”, page 690 . – Check the Intake Manifold Sensor - GX9-. Refer to ⇒ I3.6.15 ntake

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						Manifold Sensor GX9, Checking", page 698 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2181 Cooling System Performance	Coolant System Performance Cooling System Performance Not In A Expect Range	• Thers_03: • Cooling system temperature to low after a sufficient air mass flow integral 75° C	• Thres_01: • Begin of air mass integration when engine temp. 30° C • Thers_02: • ECT @ start -10 – 60° C • AAT > -10° C • Fuel cut off not active • And • Engine load 14.0 – 95.0% • Air mass_01: • Integrated air mass depending on engine temp. at start and AAT 4.0 – 13.5 kg/h (CBTA) • Integrated air mass depending on engine temp. at start and AAT 4.0 – 13.47 kg/h (CBUA) • Depending on temp. at engine start and min. observed AAT for longer than 120.0 – 180.0 s • Depending on temp. at engine start and min. observed AAT for more than 4.0 – 12.0 kg • At time of fault decision: • Average air mass flow 35.0 – 280.0 kg/h • Average vehicle speed 30 – 120 km/h	• 2.0 s • Once / DCY	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2184 Engine Coolant Temperature Sensor 2 Circuit Low	Fan Control Coolant Temperature Sensor Short To Ground	• ECT outlet > 140° C		• 2.0 s • Continuous	• 2 DCY	– Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .
P2185 Engine Coolant Temperature Sensor 2 Circuit High	Fan Control Coolant Temperature Sensor Short To Battery / Open Circuit	• ECT outlet < -40° C		• 2.0 s • Continuous	• 2 DCY	– Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2187 System Too Lean at Idle Bank 1	Fuel System Too Lean @ Idle	• Adaptive value > 5.02%	• Time after engine start n.a. • Engine speed < 860 RPM • Mass air flow < 35.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Delta part load adaptation ready • Lambda control closed loop • Evap purge valve closed • If low fuel signal then wait until fuel consumption n.a.	• 40.0 s • Multiple	• 2 DCY	– Check the vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking”, page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2188 System Too Rich at Idle Bank 1	Fuel System Too Rich @ Idle	• Adaptive value < -5.02%	• Time after engine start n.a. • Engine speed < 860 RPM • Mass air flow < 35.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Delta part load adaptation ready • Lambda control closed loop • Evap purge valve closed • If low fuel signal then wait until fuel consumption n.a.	• 40.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking”, page 716 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking”, page 690 . – Check the Intake Manifold Sensor - GX9-. Refer to ⇒ I3.6.15 ntake

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						Manifold Sensor GX9, Checking", page 698 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2195 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 1	Oxygen Sensors Front Out Of Range	• Delta lambda of 2nd lambda control loop > 0.065 [-] (CBTA) • Delta lambda of 2nd lambda control loop > 0.070 [-] (CBUA)	• Modeled exhaust gas temp 400 – 1,000° C • Delta engine load < 12.0% • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front ready • O2S heater rear ready • Fuel cut off not active • Catalyst heating not active • SAI not active • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V	• 100.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2196 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 1	Oxygen Sensors Front Out Of Range	• Delta lambda of 2nd lambda control loop < -0.065 [-] (CBTA) • Delta lambda of 2nd lambda control loop < -0.070 [-] (CBUA)	• Modeled exhaust gas temp 400 – 1,000° C • Delta engine load < 12.0% • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front ready • O2S heater rear ready • Fuel cut off not active • Catalyst heating not active • SAI not active • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V	• 100.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit -GX1-/ Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2237 O2 Sensor Positive Current Control Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Pump Current (IP)	• O2S signal front < 1.70 V • And • Fuel cutoff > 3.0 s	• O2S ceramic temp > 720° C • Electrical adjustment not active • Heater control closed loop • Evap purge valve ready	• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
		• O2S signal front 1.49 – 1.51 V • And • Delta lambda controller > 0.10 [-]	• O2S ceramic temp > 720° C • Lambda modulation > 0.02 [-] • Lambda control closed loop • Heater control closed loop	• 6.5 s • Multiple		
P2243 O2 Sensor Reference Voltage Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Nernst Voltage (UN)	• O2S signal front > 4.70 V • And • Internal resistance > 950.0 Ω	• Heater control active	• 25.5 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
		• O2S signal front < 0.20 V • And • Internal resistance > 950.0 Ω				
P2251 O2 Sensor Negative Current Control Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Virtual Mass (VM)	• O2S signal front 1.47 – 1.53 V • And • Internal resistance > 950.0 Ω	• Modeled exhaust gas temp < 750 Ω • No fuel cutoff > 2.0 s • Heater control active	• 30.5 s	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2257 AIR System Control "A" Circuit Low	Air Pump Relay Short To Ground	• Signal voltage < 3.0 V	• Pump relay commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .
P2258 AIR System Control "A" Circuit High	Air Pump Relay Short To Battery Plus	• Signal current 0.60 – 1.20 A	• Pump relay commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .
P2270 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF Stuck Lean (If Sensor Stuck Lean: 30.0% Enrichment) (CBTA)	• O2S signal rear not oscillating at reference < 600.0 mV	• Mass air flow 22.0 – 120.0 kg/h (CBTA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 30.0 s (CBTA) • 2nd lambda control closed loop	• 210.0 s (CBTA) • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear 2 - Point - LSF Stuck Lean (If Sensor Stuck Lean: 20.0 - 30.0% Closed Loop Enrichment) (CBUA)		• Mass air flow 30.0 – 120.0 kg/h (CBUA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 10.0 s (CBUA) • 2nd lambda control closed loop	• 80.0 s (CBUA) • Multiple		– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)”, page 680 .
P2271 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF Stuck Rich (If Sensor Stuck Rich: 7.0% Enleanment) If Enleanment Is Not Successful: Waiting For Next Fuel Cut Off (CBTA)	(CBTA) • O2S signal rear not oscillating at reference > 600.0 mV	(CBTA) • Mass air flow 22.0 – 120.0 kg/h (CBTA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 30.0 s (CBTA) • Fuel cut off > 3.0 s • 2nd lambda control closed loop	• 210.0 s (CBTA) • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking”, page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear (Binary Check Of Response Time At Fuel Cut Off (CBTA)	(CBTA) • Response time at fuel cut off > 6.0 s • And • Measurement range from fuel cut off to voltage threshold <= 191.0 mV • And • Number of checks (initial phase) >= 1.0 [-] • Or • Measurement range from fuel cut off to O2 mass flow threshold >= 7,000.0 mg • And • Number of checks (initial phase) >= 1.0 [-]	(CBTA) • Rich voltage (enable) >= 548.0V • Lean voltage <= 191.0V • O2S rear ready • Rear O2-sensor signal oscillating • Monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2-Sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131,070.0 Ω	• 6.0 s (CBTA) • Multiple		
	Oxygen Sensors Rear 2 - Point - LSF Stuck Rich (If Sensor Stuck Rich: 7.0% - 15.0% Closed Loop Enleanment) If Enleanment Is Not Successful: Waiting For Next Fuel Cut Off (CBUA)	(CBUA) • O2S signal rear not oscillating at reference > 600.0 mV	(CBUA) • Mass air flow 30.0 – 120.0 kg/h (CBUA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 10.0 s (CBUA) • Fuel cut off > 3.0 s • 2nd lambda control closed loop	• 80.0 s (CBUA) • Multiple		– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)”, page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear (Binary LSF) Check Of Response Time At Fuel Cut Off (CBUA)	(CBUA) • Response time at fuel cut off > 6.0 s • And • Measurement range from fuel cut off to voltage threshold <= 191.0 mV • And • Number of checks (initial phase) >= 1.0 [-] • Or • Measurement range from fuel cut off to O2 mass flow threshold >= 4,000.0 mg • And • Number of checks (initial phase) >= 1.0 [-]	(CBUA) • Rich voltage (enable) >= 548.0V • Lean voltage n.a. • O2S rear ready • Rear O2-sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131,070.0 Ω	• 4.5 s (CBUA) • Multiple		
P2274 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF Stuck Lean (If Sensor Stuck Lean: 30.0% Enrichment)	• O2S signal rear not oscillating at reference < 600.0 mV	• Mass air flow 22.0 – 120.0 kg/h • Modeled exhaust gas temp. > 350° C • O2S rear readiness > 30.0 s • 2nd lambda control closed loop	• 210.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2275 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF Stuck Rich (If Sensor Stuck Rich: 7.0% Enleanment) If Enleanment Is Not Successful: Waiting For Next Fuel Cut Off	• O2S signal rear not oscillating at reference > 600.0 mV	• Mass air flow 22.0 – 120.0 kg/h • Modeled exhaust gas temp. > 350° C • O2S rear readiness > 30.0 s • Fuel cut off active • 2nd lambda control closed loop	• 210.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .
	Oxygen Sensors Rear (Binary LSF) Check Of Response Time At Fuel Cut Off	• Response time at fuel cut off > 6.0 s • And • Measurement range from fuel cut off to voltage threshold <= 191.0 mV • And • Number of checks (initial phase) >= 1.0 [-] • Or • Measurement range from fuel cut off to O2 mass flow threshold >= 7,000.0 mg • And • Number of checks (initial phase) >= 1.0 [-]	• Rich voltage (enable) >= 548.0V • Lean voltage n.a. • O2S rear ready • Rear O2 - sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131,070.0 Ω	• 4.5 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2279 MAP/ MAF - Throttle Position Correlation	Leak to Intake Manifold Adaptation Value Monitoring	• Offset value throttle mass flow > 13.0 kg/h	• Desired mass flow 0.0 – 25.0 kg/h • EVAP purge valve closed • EGR off	• 10.0 s • Multiple	• 2 DCY	• Check for air leaks near the throttle body, oil fill cap not tight or oil dipstick not seated in tube. Also check for any engine gaskets that can cause additional air to enter the crankcase can set this fault as the PCV system is not metered. If a vacuum leak or crankcase seal is the cause, the idle may be rough or unstable. – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 . – Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regu-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						lator Valve 1 N80, Checking", page 688 .
P2300 Ignition Coil "A" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2301 Ignition Coil "A" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2303 Ignition Coil "B" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2304 Ignition Coil "B" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2306 Ignition Coil "C" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2307 Ignition Coil "C" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2309 Ignition Coil "D" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2310 Ignition Coil "D" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2312 Ignition Coil "E" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2313 Ignition Coil "E" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2400 EVAP System Leak Detection Pump Control Circuit/ Open	LDP Open Circuit	• Signal voltage > 4.40 – 5.60 V	• LDP commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2401 EVAP System Leak Detection Pump Control Circuit Low	LDP Short To Ground	• Signal voltage < 2.15 – 3.25 V	• LDP commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .
P2402 EVAP System Leak Detection Pump Control Circuit High	LDP Short To Battery Plus	• Signal current > 3.0 A	• LDP commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2403 EVAP System Leak Detection Pump Sense Circuit/ Open	Reed Sensor Rationality Check Unable To Close	• Low signal voltage > 0.5 s	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Altitude < 2,700.0 m • Integrated purge flow > 29.90 g • Restart temperature difference > 52 K • Vehicle speed >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Evap purge valve ready • LDP commanded off	• 0.5 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .
P2404 EVAP System Leak Detection Pump Sense Circuit Range/ Performance	Reed Sensor Rationality Check Unable To Open	• High signal voltage > 12.0 s • And • Number of checks 30.0 [-]	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Altitude < 2,700.0 m • Intake manifold vacuum > -2,560.0 hPa • Restart temperature difference > 52 K • Vehicle speed >= 0 km/h	• 12.0 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Cumulative time of high signal voltage during pumping > 10.0 s	• Vehicle speed ones > 30 km/h • Selected gear any drive • Evap purge valve closed, ready • LDP commanded on	• 120.0 s • Once / DCY		
P2414 O2 Sensor Exhaust Sample Error Bank 1 Sensor 1	Oxygen Sensors Front Signal Range Check (Check For Sensor At Ambient Air)	• Threshold 1: • Signal voltage 3.10 – 4.77 V • Threshold 2: • Signal voltage 2.50 – 3.06 V • Depending on gain factor that actual is used for sensor	• Lambda value < 1.6 [-] • O2S ceramic temp. > 715° C • Fuel cut off not active • Heater control closed loop • SAI not active • If low fuel signal then wait > 0.0 s	• 15.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
P2431 AIR System Air Flow/ Pressure Sensor Circuit Range/ Performance Bank 1	Air System Pressure Sensor Rationality Check	• Difference between SAI pressure and ambient pressure not (-60.0 – 60.0_ hPa	• SAI done	• 0.5 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 .
P2432 AIR System Air Flow/ Pressure Sensor Circuit Low Bank 1	Air System Pressure Sensor Signal Range Check	• Signal voltage < 0.5 V		• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2433 AIR System Air Flow/ Pressure Sensor Circuit High Bank 1	Air System Pressure Sensor Signal Range Check	• Signal voltage > 4.5 V		• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 .
P2440 AIR System Switching Valve Stuck Open Bank 1	Air System Check After SAI	• SAI pressure measured with SAI pressure sensor vs. modeled while SAI valve closed < 65.0%	• ECT 5 – 108° C • IAT 5 – 100° C • Altitude < 2,700.0 m • SAI pressure sensor ready	• 45.0 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve -N112-. Refer to ⇒ S3.6.26 econdary Air Injection Solenoid Valve N112, Checking", page 723 . – Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2626 O2 Sensor Pumping Current Trim Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Adjustment Voltage (IA)	• O2S signal front > 4.77 V	• Modeled exhaust temp. < 750° C • O2S ceramic temp. > 720° C • Fuel cut off active • Heater control closed loop • If low fuel signal then wait > 0.0 s	• 2.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
P3081 Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	Engine Coolant Temperature Sensor Rationality Measured Engine Coolant Temp. Below Reference Model	• Range_01: • Measured engine coolant temp. not within in a range of the reference model > 11 K	• Modmax_01: • Maximum reference temperature 60° C	• 4.0 s • Multiple	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 .
U0001 High Speed CAN Communication Bus	CAN: CAN-Bus Reading Back Sent Message (Powertrain)	• CAN message no feedback	• Time after ignition on 500.0 ms	• 250.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .
U0002 High Speed CAN Communication Bus Performance	CAN: CAN-Bus CAN Communication Check (Powertrain)	• Global time out receiving no message	• Time after ignition on 500.0 ms	• 450.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
U0101 Lost Communication with TCM	CAN: TCM CAN Communication With TCM	• Received CAN message no message	• Time after ignition on 500.0 ms	• 500.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance between the Transmission Control Module to the Engine/ Motor Control Module - J623-. Refer to ⇒ C3.6.5 AN-Bus Terminal Resistance, Powertrain, Checking", page 678 .
U0121 Lost Communication With Anti-Lock Brake System (ABS) Control Module "A"	CAN: Brake Unit CAN Communication With Brake Unit	• Received CAN message no message	• Time after ignition on 500.0 ms	• 440.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .
U0146 Lost Communication With Gateway "A"	CAN: Gateway CAN Communication With Gateway	• Received CAN message no message	• Time after ignition on 500.0 ms	• 1,000.0 ms • Continuous	• 2 DCY	Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
U0155 Lost Communication With Instrument Panel Cluster (IPC) Control Module	CAN: Instrument Cluster CAN Communication With Instrument Cluster Module	• Received CAN message no message	• Time after ignition on 500.0 ms	• 500.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .
U0302 Software Incompatibility With Transmission Control Module	CAN: TCM CAN Communication With TCM	• Received AT vehicle data TCM signal	• Time after ignition on 500.0 ms	• 100.0 ms • Continuous	• 2 DCY	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Transmission Control Module. Refer to appropriate repair manual.
U0402 Invalid Data Received From TCM	CAN: TCM CAN Communication With TCM	• Received data implausible message	• Time after ignition on 500.0 ms	• 60.0 ms • Continuous	• 2 DCY	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Transmission Control Module. Refer to appropriate repair manual.
U0415 Invalid Data Received From Anti-Lock Brake System (ABS) Control	CAN: Vehicle Speed Sensor CAN Communication With Vehicle Speed Sensor	• Speed sensor signal: initialization error 327.08 km/h • Speed sensor signal: low voltage error 327.25 km/h		• 1,980.0 ms	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 . – Check the vehicle

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
Module "A"		• Speed sensor signal: sensor error 327.42 km/h		• 480.0 ms • Continuous		speed signal. Refer to ⇒ V3.6.29 ehicle Speed Signal, Checking", page 729 .
		• Vehicle speed >= 325 km/h		• 2,100.0 ms • Continuous		
		• Speed sensor signal: out of range 326.39 km/h		• 480.0 ms • Continuous		
	CAN: Brake Unit CAN Communication With Brake Unit	• Received data implausible message	• Time after ignition on 500.0 ms	• 60.0 ms • Continuous		
U0422 Invalid Data Received From Body Control Module	CAN: Ambient Air Temperature Sensor Communication With Instrument Cluster Module	• Ambient temperature value (initialization) 0.0 h [-]	• Key on • Status ambient temperature from instrument cluster no fault • Electrical check ambient temperature sensor no fault	• 3.0 s • Multiple	• 2 DCY	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Body Control Module. Refer to appropriate repair manual.
U0423 Invalid Data Received From Instrument Panel Cluster Control Module	CAN: Instrument Cluster CAN Communication With Instrument Cluster Module	• Received CAN message implausible message	• Time after ignition on 500.0 ms	• 600.0 ms • Continuous	• 2 DCY	– Check for correct software version and VIN or update software for the IPC Module if available. If OK, replace the Instrument Cluster Control Module - J285-. Refer to appropriate repair manual.
	CAN: Ambient Air Temperature Sensor Communication With Instrument Cluster Module (CBTA)	• Ambient temperature value (initialization) 0.0 h [-]	• Key on • Status ambient temperature from instrument cluster no fault • Electrical check ambient temperature sensor no fault	• 3.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
U0447 Invalid Data Received From Gateway "A"	CAN: Gateway CAN Communication With Gateway	• Received data implausible message	• Time after ignition on 500.0 ms	• 300.0 ms • Continuous	• 2 DCY	Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P000A "A" Camshaft Position Slow Response Bank 1	VVT Actuator Intake Slow Response	• Difference between target position vs. actual position > 8 – 12° CRK (CBTA) • Difference between target position vs. actual position > 8° CRK (CBUA) • And • Adjustment angle > 3° CRK	• Time after engine start > 1.5 – 3.0 s • Engine speed 600 – 6,320 RPM • Oil temperature -48 – 143° C • Frequency (normal operation) 7.0 times [-] (CBTA) • Frequency (normal operation) 4.0 times [-] (CBUA) • Or (CBTA) • Frequency (CSM) 1.0 times [-] (CBTA)	• 21.0 (CBTA) • 12.0 s (CBUA) • Multiple	• 2 DCY	– Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0010 "A" Camshaft Position Actuator "A" Control Circuit/ Open Bank 1	VVT Actuator Intake Open Circuit	• Signal voltage > 4.40 – 5.60 V	• Camshaft valve off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0011 "A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	VVT Actuator Intake Target Error	• Difference between target position vs. actual position > 8 – 12° CRK (CBTA) • Difference between target position vs. actual position > 8° CRK (CBUA) • And • Adjustment angle > 3° CRK	• Time after engine start > 1.5 – 3.0 s • Engine speed 600 – 6,320 RPM • Oil temperature -48 – 143° C • Frequency (normal operation) 7.0 times [-] (CBTA) • Frequency (normal operation) 4.0 times [-] (CBUA) • Or (CBTA) • Frequency (CSM) 1.0 times [-] (CBTA)	• 21.0 (CBTA) • 12.0 s (CBUA) • Multiple	• 2 DCY	– Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0016 Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	Camshaft Position Sensor Inlet Angular Offset Check	• Permissible deviation < -13.5° CRK • Or • Permissible deviation > 13.5° CRK		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking”, page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking”, page 674 . – Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking”, page 672 .
P0030 HO2S Heater Control Circuit Bank 1 Sensor 1	Oxygen Sensors Heater Front Open Circuit	• Heater voltage 2.34 – 3.59 V	• Time after engine start > 5.0 s • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking”, page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0031 HO2S Heater Control Circuit Low Bank 1 Sensor 1	Oxygen Sensors Heater Front Short To Ground	• Heater voltage < 2.34 V	• Time after engine start > 5.0 s • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
P0032 HO2S Heater Control Circuit High Bank 1 Sensor 1	Oxygen Sensors Heater Front Short To Battery Plus	• Heater voltage > 3.59 V	• Time after engine start > 5.0 s • Heater commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0036 HO2S Heater Control Circuit Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Open Circuit	• Heater voltage 4.50 – 5.50 V	• Engine speed > 80 RPM (CBTA) • Time after engine start > 5.0 s (CBUA) • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0037 HO2S Heater Control Circuit Low Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Ground	• Heater voltage < 3.0 V	• Engine speed > 80 RPM (CBTA) • Time after engine start > 5.0 s (CBUA) • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0038 HO2S Heater Control Circuit High Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Battery Plus	• Heater current 2.70 – 5.50 A	• Engine speed > 80 RPM (CBTA) • Time after engine start > 5.0 s (CBUA) • Heater commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0042 HO2S Heater Control Circuit Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Open Circuit	• Heater voltage 4.50 – 5.50 V	• Engine speed > 80 RPM • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0043 HO2S Heater Control Circuit Low Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Ground	• Heater voltage < 3.0 V	• Engine speed > 80 RPM • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0044 HO2S Heater Control Circuit High Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Battery Plus	• Heater current 2.70 – 5.50 A	• Engine speed > 80 RPM • Heater commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .
P0070 Ambient Air Temperature Sensor Circuit "A"	Ambient Air Temperature Sensor Short To Battery / Open Circuit	• Ambient air temperature < -50° C	• CAN active	• 6.0 s • Multiple	• 2 DCY	– Check the Outside Air Temperature Sensor -G17-. Refer to ⇒ O3.6.21 utside Air Temperature Sensor G17, Checking", page 711 . – Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0071 Ambient Air Temperature Sensor Circuit "A" Range/ Performance	Ambient Air Temperature Sensor Range/ Performance	• Diff. ECT vs. IAT at engine start (depending on engine off time) < 24.75° C • And • Diff. IAT vs. AAT at engine start (depending on engine off time) > 24.75° C • And • Diff. AAT vs. ECT at engine start (depending on engine off time) > 24.75° C	• Engine off time > 6.0 h • Blockheater • ECT >= 143° C • Time after engine start 2.0 s • Or • Diff. ECT vs. ECT outlet <= 20° C • Time after engine start 2.0 s • Solar radiation case 1: • AAT @ start <= 2° C • Minus • AAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s • Solar radiation case 2: • IAT @ start <= 2° C • Minus • IAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s	• 60.0 s • Once / DCY	• 2 DCY	– Check the Outside Air Temperature Sensor - G17-. Refer to ⇒ O3.6.21 utside Air Temperature Sensor G17, Checking", page 711 . – Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0072 Ambient Air Temperature Sensor Circuit "A" Low	Ambient Air Temperature Sensor Short To Ground	• Ambient air temperature > 87° C	• CAN active	• 6.0 s • Multiple	• 2 DCY	– Check the Outside Air Temperature Sensor -G17-. Refer to ⇒ O3.6.21 utside Air Temperature Sensor G17, Checking”, page 711 . – Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking”, page 676 .
P0106 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Range/ Performance	Manifold Pressure Sensor Rationality Check Low	• Difference manifold pressure - lower threshold model < 0.0 hPa • Model range 0.0 – 800.0 hPa	• Time after engine start n.a.	• 450.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking”, page 726 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking”, page 698 .
	Manifold Pressure Sensor Rationality Check High	• Difference manifold pressure - lower threshold model > 0.0 hPa • Model range 650.0 – 1,080.0 hPa				
	Manifold Pressure Sensor Rationality Check	• Diff. altitude sensor signal vs. manifold pressure signal at engine start > 60.0 hPa	• Time after engine start < 25.0 s • Engine speed < 330 RPM			
	Manifold Pressure Sensor Adaptation Value Monitoring	• Offset value manifold pressure for load calculation in driving condition range 2.0 > 55.0 hPa	• Driving condition range 1 (omsna): • Engine speed < 800 RPM			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Offset value manifold pressure for load calculation in driving condition range 2.0 < -60.0 hPa	• Desired mass flow 5.0 – 25.0 kg/h • Delta adaptation value range 1.0 < 0.10 kg/h • For time 1.0 s • Driving condition range 2 (opsra): • Engine speed > 1,400 RPM • Manifold pressure < 425.0 hPa • Delta adaptation value range 2.0 < 2.97 hPa • For time 8.0 s • Driving condition range 3 (opua): • Desired mass flow > 40.0 kg/h • Manifold pressure > 550.0 hPa • Delta adaptation value range 3.0 < 2.97 hPa • For time 5.0 s • General: • Engine operation in every driving condition >= 2.0 times • Diagnosis evap purge system not active • Engine speed 500 – 6,000 RPM • Manifold pressure > 0.0 hPa • Ratio manifold pressure to ambient pressure < 0.85 [-]			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0107 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Low	Manifold Pressure Sensor Short To Ground	• Signal voltage < 0.20 V		• 1.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .
P0108 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit High	Manifold Pressure Sensor Short To Battery / Open Circuit	• Signal voltage > 4.86 V		• 1.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0111 Intake Air Temperature Sensor 1 Circuit Range/ Performance Bank 1	Intake Air Temperature Rationality Check	• Diff. ECT vs. IAT at engine start (depending on engine off time) > 24.75° C • And • Diff. IAT vs. AAT at engine start (depending on engine off time) > 24.75° C • And • Diff. AAT vs. ECT at engine start (depending on engine off time) < 24.75° C	• Engine off time > 6.0 h • Blockheater • ECT >= 143° C • Time after engine start 2.0 s • Or • Diff. ECT vs. ECT outlet <= 20° C • Time after engine start 2.0 s • Solar radiation case 1: • AAT @ start <= 2° C • Minus • AAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s • Solar radiation case 2: • IAT @ start <= 2° C • Minus • IAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s	• 60.0 s • Once / DCY	• 2 DCY	– Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 . – Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0112 Intake Air Temperature Sensor 1 Circuit Low Bank 1	Intake Air Temperature Sensor Short To Ground	• IAT > 130° C		• 5.0 s • Multiple	• 2 DCY	– Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 . – Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0113 Intake Air Temperature Sensor 1 Circuit High Bank 1	Intake Air Temperature Sensor Short To Battery / Open Circuit	• IAT < -46° C		• 5.0 s • Multiple	• 2 DCY	– Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 . – Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0116 Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	Engine Coolant Temperature Sensor Stuck Low	• Thres_01[f(ECT)]:Temp_01 • No change on signal 1.5 K	• ECT @ start n.a. • ECT 50 – 75° C • Cold start n.a. • Temp_02 • Substitute ECT > -45° C • Driving condition L: • Vehicle speed 0 – 20 km/h • Mass air flow 4.0 – 40.0 kg/h • Time required / > 10.0 s • Frequency 3.0 times • And • Driving condition H: • Vehicle speed 50 – 150 km/h • Mass air flow 32.0 – 352.0 kg/h • Time required / > 40.0 s • Frequency once	• 70.0 s • Once / DCY	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Engine Coolant Temperature Sensor Stuck High		• Temp_01 • ECT @ start n.a. • ECT 105 – 140° C • Cold start n.a. • Temp_02 • Substitute ECT > -45° C • Driving condition L: • Vehicle speed 0 – 20 km/h • Mass air flow 4.0 – 40.0 kg/h • Time required / > 10.0 s • Frequency 3.0 times • And • Driving condition H: • Vehicle speed 50 – 150 km/h • Mass air flow 32.0 – 352.0 kg/h • Time required / > 40.0 s • Frequency once			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Engine Coolant Temperature Sensor Stuck In Range	• Signal in range 75.0 – 105.0° C • And • No change on signal n. a.	• Cold start detected • Stuck high n.a. • Temp_01 • ECT @ start n.a. • Temp_02 • Substitute ECT n.a. • Driving condition L: • Vehicle speed n.a. • Mass air flow n.a. • time required / n.a. • Frequency n.a. • And • Driving condition H: • Vehicle speed n.a. • Mass air flow n.a. • Time required / n.a. • Frequency n.a.	• 2.0 s • Once / DCY		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0117 Engine Coolant Temperature Sensor 1 Circuit Low	Engine Coolant Temperature Sensor Short To Ground	• ECT > 140° C		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0118 Engine Coolant Temperature Sensor 1 Circuit High	Engine Coolant Temperature Sensor Short To Battery / Open Circuit	• ECT < -40° C		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.
P0121 Throttle/ Pedal Position Sensor/ Switch "A" Circuit Range/ Performance	Throttle Position Sensor 1 Rationality Check	• TPS1-TPS2 > 6.30% • And • • Actual TPS1 - calc. value > actual TPS2 - calc. value • Or • TPS1 - calc. value > 9.0%	• Engine speed > 480 RPM	• 0.3 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0122 Throttle/ Pedal Position Sensor/ Switch "A" Circuit Low	Throttle Position Sensor 1 Out Of Range Low	• Signal voltage < 0.20 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0123 Throttle/ Pedal Position Sensor/ Switch "A" Circuit High	Throttle Position Sensor 1 Out Of Range High	• Signal voltage > 4.81 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0130 O2 Sensor Circuit Bank 1 Sensor 1	Oxygen Sensors Front Out Of Range	• O2S ceramic temp. < 640° C	• Modeled exhaust temp > 300° C • Fuel cut off not active	• 15.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0131 O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	Oxygen Sensors Front Signal Range Check	• Short to ground • Virtual mass (VM) < 1.75 V • Or • Nernst voltage (UN) < 1.50 V • Or • Adjustment voltage (IA) < 0.30 V • Or • Adjustment voltage (IP) < 0.30 V		• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
P0132 O2 Sensor Circuit High Voltage Bank 1 Sensor 1	Oxygen Sensors Front Signal Range Check	• Short to battery • Virtual mass (VM) > 3.25 V • Or • Nernst voltage (UN) > 4.40 V • Or • Adjustment voltage (IA) > 7.0 V • Or • Adjustment voltage (IP) > 7.0 V		• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0133 O2 Sensor Circuit Slow Response Bank 1 Sensor 1	Oxygen Sensors Front Response Rate Monitoring, Area Ratio	• Symmetric fault: • Lower value of both area ratios R2L and L2R < 0.25 [-] (CBTA) • Lower value of both area ratios R2L and L2R < 0.20 [-] (CBUA) • And • Difference of R2L area ratio vs. L2R area ratio -0.40 – 0.40 [-] • Asymmetric fault: • Lower value of both area ratios R2L and L2R < 0.25 [-] (CBTA) • Lower value of both area ratios R2L and L2R < 0.35 [-] (CBUA) • And • Difference of R2L area ratio vs. L2R area ratio not (-0.40 – 0.40) [-] • General: • Lower value of both counters for area ratio R2L and L2R >= 5 times	• O2S front - min. operation temperature is reached > 720° C • O2S front - time since operation readiness > 40.0 s • Engine speed 1,160 – 2,720 RPM • Engine load 13.99 – 45.0% • Gradient of engine load <= 7.99% • Exhaust system lag time calculation 0.15 – 0.33 s • Gradient of exhaust system lag time calculation <= 0.0 s • ECT >= 10° C • Catalyst temperature >= 450° C • Lambda control set-point prior to diagnostic fuel steps A/F-ratio stoichiometric • Relative fuel amount from wall applied compensation and evap purge <= 0.1 [-] • Canister load < 15.0 [-] • Time since last measurement > 3.0 s • 2nd lambda control loop not active • Forced lambda oscillation not active • SAI not active • Tank leakage detection not active	• 67.0 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ "3.6.23 Oxygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
			• Diagnosis evap purge system not active • Fuel cut off for any cylinders not active • Open circuit pump current (IP) ready • Only Flex fuel systems without ethanol sensor: • Ethanol concentration adaptation not active			
P0135 O2 Sensor Heater Circuit Bank 1 Sensor 1	Oxygen Sensors Heater Front Out Of Range High	• O2S ceramic temperature < 720° C • And • Heater duty cycle > 100.0%	• Modeled exhaust gas temp. > 550° C • Heater control active	• 70.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
	Oxygen Sensors Heater Front Rationality Check (Sensor Heating Up)	• O2S ceramic temp < 715° C • And • Time after O2S heater on 35.0 s	• ECT at start > -10° C • Engine shutoff time > 120.0 s • During ECM keep alive time (key off) < 500.0 s	• 35.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0136 O2 Sensor Circuit Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Heater Coupling Check)	• Delta voltage one step at heater switching > 2.0 V • And • Number of heater coupling >= 6.0 times [-]	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • For time > 10.0 s • Heater not active • For time > 0.0 s	• 60.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0137 O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Short To Ground, Core Connection Signal Wires)	• Signal voltage < 0.06 V • For time > 3.0 s • And • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) < 0.01 V	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time n.a. (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time n.a. (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • Fuel cut off not active • Catalyst purge not active	• 3.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0138 O2 Sensor Circuit High Voltage Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Out Of Range High (Short To Battery Plus)	• Signal voltage > 1.08 V • For time > 5.0 s	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • Lambda set value > 0.995 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0139 O2 Sensor Circuit Slow Response Bank 1 Sensor 2	Oxygen Sensors Rear (Binary LSF) Check Of Transient Time At Fuel Cut Off	• EWMA filtered transient time at fuel cut off > 0.6 s • O2 voltage between 201.0 – 401.0 mV • Number of checks (initial phase) >= 4.0 [-] • Number of checks (step function) >= 3.0 [-]	• Rich voltage (enable) >= 548.0 mV • Lean voltage n.a. • O2S rear ready • Rear O2 - sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131,070.0 Ω • Or • Trigger for step change: delta transient time > 0.3 s	• 4.5 s • Multiple	• 1 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P013A O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	• EWMA filtered max differential transient time at fuel cutoff >= 0.8 s • And • Number of checks >= 1.0 [-]	• Time of fuel cutoff <= 90.0 s • Time after last fuel cutoff >= 5.0 s • Rear O2S ready • Exhaust temp at sensor deviation between actual and expected lambda signal < 8 after time since fuel cutoff at first cylinder >= 2.0 s • Exhaust mass flow >= 12.0 kg/h • Exhaust mass flow dynamic within range -500.0 – 500.0 kg/h • Sensor voltage at start of measurement > 0.45 V • Target voltage end of measurement <= 0.15 V	• 10.0 s	• 1 DCY	– For CBTA: Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – For CBUA: Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0140 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Signal Line Open Circuit)	• Signal voltage 0.40 – 0.60 V • For time > 3.0 s • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3.0 measurements) >= 2.80 V	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded	• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Ground Line Open Circuit)	• Internal resistance > 40,000.0 Ω • And • Exhaust temperature > 670° C	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • Valid Ri-measurements > 10.0 times [-]	• 50.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0141 O2 Sensor Heater Circuit Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Out Of Range	• Heater resistance 1,200.0 – 32,400.0 Ω (CBTA) • Heater resistance 880.0 – 30,400.0 Ω (CBUA)	• Modeled exhaust gas temp. 200 – 680° C • Engine shut-off-time > 120.0 s • (During ECM keep alive-time after ignition off) < 500.0 s (CBTA) • (During ECM keep alive-time after ignition off) < 1,200.0 s (CBUA) • Number of checks 10.0 [-] • Fuel cut off not active • Heater commanded on	• 6.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0142 O2 Sensor Circuit Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Heater Coupling Check)	• Delta voltage one step at heater switching > 2.0 V • And • Number of heater coupling >= 6.0 times [-]	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 - 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • For time > 10.0 s • Heater not active • For time > 0.0 s	• 60.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0143 O2 Sensor Circuit Low Voltage Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Short To Ground, Core Connection Signal Wires)	• Signal voltage < 0.06 V • For time > 3.0 s • And • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3.0 measurements) < 0.01 [V]	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time n.a. • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time n.a. • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • Fuel cut off not active • Catalyst purge not active	• 3.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0144 O2 Sensor Circuit High Voltage Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Out Of Range High (Short To Battery Plus)	• Signal voltage > 1.08 V • For time > 5.0 s	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • Lambda set value > 0,995 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0145 O2 Sensor Circuit Slow Response Bank 1 Sensor 3	Oxygen Sensors Rear (Binary LSF) Check Of Transient Time At Fuel Cut Off	• EWMA filtered transient time at fuel cut off > 1.5 s • In voltage range 201.0 – 401.0 mV • Number of checks (initial phase) >= 4.0 [-] • Number of checks (step function) >= 3.0 [-]	• Rich voltage enable >= 548.0 mV • Lean voltage n.a. • O2S rear ready • Rear O2 - sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 - sensor internal resistance <= 131,070.0 Ω • Or • Trigger for step change: delta transient time > 0.3 s	• 4.5 s • Multiple	• 1 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0146 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Signal Line Open Circuit)	• Signal voltage 0.40 – 0.60 V • For time > 3.0 s • And • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3.0 measurements) >= 2.80 V	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded	• 5.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Ground Line Open Circuit)	• Internal resistance > 40,000.0 Ω • And • Exhaust temperature > 670° C	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • Valid Ri-measurements > 10.0 times [-]	• 50.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0147 O2 Sensor Heater Circuit Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Out Of Range	• Heater resistance 1,200.0 – 32,400.0 Ω	• Modeled exhaust gas temp. 200 – 680° C • Engine shut-off-time > 120.0 s • (During ECM keep alive-time after ignition off) < 500.0 s • Number of checks 10.0 [-] • Fuel cut off not active • Heater commanded on	• 6.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .
P0169 Incorrect Fuel Composition	ECM: EGAS Module Function Monitoring: Injection Time	• Comparison with fuel quantity incorrect	• Internal engine speed > 1,200 RPM	• 0.5 s • Continuous	• 2 DCY	– Check for contaminated/aged fuel or possible high concentration of alcohol in fuel (above 15%). Poor quality fuel will also increase consumption. Replace with fresh fuel if believed to be contaminated. Refer to appropriate repair manual. – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒
	ECM: EGAS Module Function Monitoring: Lambda Mode	• Internal check failed				
	ECM: EGAS Module Function Monitoring: Mixture Control	• Correction factor incorrect				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Fuel quantity incorrect				O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – If fuel quality is adequate, replace the Engine/ Motor Control Module. Refer to appropriate repair manual.
P0201 Cylinder 1 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0202 Cylinder 2 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0203 Cylinder 3 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0204 Cylinder 4 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0205 Cylinder 5 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0221 Throttle/ Pedal Position Sensor/ Switch "B" Circuit Range/ Performance	Throttle Position Sensor 2 Rationality Check	• TPS1 - TPS2 > 6.30% • And • • Actual TPS2 - calc. value > actual TPS1 - calc. value • or • TPS2 - calc. value > 9.0%	• Engine speed > 480 RPM	• 0.3 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking”, page 726 .
P0222 Throttle/ Pedal Position Sensor/ Switch "B" Circuit Low	Throttle Position Sensor 2 Out Of Range Low	• Signal voltage < 0.20 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking”, page 726 .
P0223 Throttle/ Pedal Position Sensor/ Switch "B" Circuit High	Throttle Position Sensor 2 Out Of Range High	• Signal voltage > 4.81 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking”, page 726 .
P0261 Cylinder 1 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 .
P0262 Cylinder 1 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0264 Cylinder 2 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0265 Cylinder 2 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0267 Cylinder 3 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0268 Cylinder 3 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0270 Cylinder 4 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0271 Cylinder 4 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0273 Cylinder 5 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0274 Cylinder 5 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0300 Random/ Multiple Cylinder Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0301 Cylinder 1 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system me-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	chanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking”, page 696 .
P0302 Cylinder 2 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low com-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	pression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0303 Cylinder 3 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)	• Rough road not detected	• 200 rev • Multiple	• Immediately	cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0304 Cylinder 4 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)	• Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 200 rev • Multiple	• Immediately	visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						Stage, Checking”, page 696 .
P0305 Cylinder 5 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking”, page 696 .
P0321 Ignition/ Distributor Engine Speed Input Circuit Range/ Performance	RPM Sensor Rationality Check	• Counted teeth vs. reference incorrect • Or • Monitoring reference gap failure		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking”, page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking”, page 674 .
P0322 Ignition/ Distributor Engine Speed Input Circuit No Signal	RPM Sensor Signal Activity Check	• Camshaft signals > 5.0 [-] • And • Engine speed no signal		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking”, page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking”, page 674 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0324 Knock / Combustion Vibration Control System Error	Knock Control Internal Hardware Check	• Signal fault counter (combustion) > 30.0 [-] • Or • Signal fault counter (measuring window) > 2.0 [-]	• Engine speed > 2,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 -G61-. Refer to ⇒ K3.6.16 nock Sensor 1 G61, Checking", page 700 . – Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking", page 702 .
P0327 Knock / Combustion Vibration Sensor 1 Circuit Low Bank 1 or Single Sensor	Knock Sensor Short To Ground Port A Knock Sensor Short To Ground Port B	• Lower threshold < -0.70 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 -G61-. Refer to ⇒ K3.6.16 nock Sensor 1 G61, Checking", page 700 . – Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking", page 702 .
	Knock Sensor Signal Range Check	• Lower threshold < 1.4 – 5.6 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		
P0328 Knock / Combustion Vibration Sensor 1 Circuit High Bank 1 or Single Sensor	Knock Sensor Short To Battery Plus Port A Knock Sensor Short To Battery Plus Port B	• Upper threshold > 1.0 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 -G61-. Refer to ⇒ K3.6.16 nock Sensor 1 G61, Checking", page 700 . – Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking", page 702 .
	Knock Sensor Signal Range Check	• Upper threshold > 23.0 – 92.0 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0332 Knock / Combustion Vibration Sensor 2 Circuit Low Bank 2	Knock Sensor Short To Ground Port A	• Lower threshold < -0.70 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking”, page 702 .
	Knock Sensor Short To Ground Port B					
	Knock Sensor Signal Range Check	• Lower threshold < 1.4 – 5.6 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		
P0333 Knock / Combustion Vibration Sensor 2 Circuit High Bank 2	Knock Sensor Short To Battery Plus Port A	• Upper threshold > 1.0 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking”, page 702 .
	Knock Sensor Short To Battery Plus Port B					
	Knock Sensor Signal Range Check	• Upper threshold > 23.0 – 92.0 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		
P0341 Camshaft Position Sensor "A" Circuit Range/ Performance Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	• Signal pattern incorrect		• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking”, page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking”, page 686 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0342 Camshaft Position Sensor "A" Circuit Low Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	• Signal voltage permanently low • Crankshaft signal 8.0 [-]		• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 .
P0343 Camshaft Position Sensor "A" Circuit High Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	• Signal voltage permanently high • Crankshaft signal 8.0 [-]		• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 .
P0351 Ignition Coil "A" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0352 Ignition Coil "B" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0353 Ignition Coil "C" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0354 Ignition Coil "D" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0355 Ignition Coil "E" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0410 AIR System "A"	Air System Check After SAI	• Deviation SAI pressure > 50.0 hPa	• Mass airflow 7.0 – 120.0 kg/h • Delta engine load -10.0 – 10.0%/rev • ECT 5 – 108° C • IAT 5 – 100° C • Altitude < 2,700.0 m • SAI pressure sensor ready	• 6.0 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 . – Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .
P0413 AIR System Switching Valve "A" Circuit Open	Air Valve Open Circuit	• Signal voltage 9.25 – 11.25 V	• Air valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve -N112-. Refer to ⇒ S3.6.26 econdary Air Injection Solenoid Valve N112, Checking", page 723 .
P0414 AIR System Switching Valve "A" Circuit Shorted	Air Valve Short To Ground	• Signal voltage < 6.0 V	• Air valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve -N112-. Refer to ⇒ S3.6.26 econdary Air Injection Solenoid Valve N112,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Air Valve Short To Battery Plus	• Signal current 2.20 – 4.20 A	• Air valve commanded on • Engine speed > 80 RPM			Checking", page 723 .
P0418 AIR System Control "A" Circuit	Air Pump Relay Open Circuit	• Signal voltage 4.50 – 5.50 V	• Pump relay commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0420 Catalyst System Efficiency Below Threshold Bank 1	Catalyst System Measure Of OSC Compared To OSC Of Borderline Catalyst	• Measured OSC / OSC of borderline catalyst measured OSC (HC and NOx-correlated) < 1.0 [-]	• Time after engine start > 343.0 s • Or • Time after dew point > 343.0 s • Delta exhaust mass flow < 25.0 kg/h • Exhaust gas mass flow, lower range 25.0 – 130.0 kg/h (CBUA) • Exhaust gas mass flow, lower range 25.0 – 120.0 kg/h (CBTA) • Exhaust gas mass flow, upper range n.a. • Modeled exhaust gas temp. dynamic < 50 K • Modeled exhaust gas temp. in catalyst system, lower range 500 – 860° C (CBUA) • Modeled exhaust gas temp. in catalyst system, lower range 560 – 860° C (CBTA) • Modeled exhaust gas temp. in catalyst system, upper range n.a. • Minimum modeled exhaust gas temp. in catalyst system > 400° C • For time > 120.0 s • Filtered minimum modeled exhaust gas temp. in catalyst system > 450° C • Engine load 12.8 – 65.3% (CBUA) • Engine load 12.8 – 60.0% (CBTA)	• 40.0 s (CBUA) • 30.0 s (CBTA) • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Three Way Catalytic Converter (TWC). Refer to ⇒ T3.6.27 hree Way Catalytic Converter (TWC), Checking", page 725 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
			• Evap purge loading not high • Engine speed 1,200 – 3,320 RPM • Range between lambda set value and lambda value < 0.02 [-] • Out of lambda range < 2.0 s • Lambda control closed loop • Lambda control not at min or max limit • Number of checks 3.0 [-] • O2S front ready • O2S rear ready • SAS not active • No misfire • O2S front response monitoring in current driving cycle ready			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0441 EVAP System Incorrect Purge Flow	EVAP System Functional Check	• Deviation lambda control < 9.0% • And • Deviation idle control < 40.0%	• Time after engine start n.a. • Engine speed idle • Engine speed deviation < 100 RPM • ECT > 60° C • Or • Substitute ECT > 80° C • IAT > 5° C • Altitude < 2,700.0 m • Lambda control closed loop	• 20.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks", page 7 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0442 EVAP System Leak Detected (Small Leak)	EVAP System Small Leak Pressure Check	• Time for pressure drop < 1.9 s	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Air temperature drop after engine start < 5 K • Intake manifold vacuum > -2,560.0 hPa • Altitude < 2,700.0 m • Vehicle speed >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Restart temperature difference > 52 K • Evap purge valve closed • LDP active • Deep down hill driving • Delta ambient pressure < 7.03 hPa • Or • Engine load not < 19.5 – 45.0% • And • Delta vehicle speed not > -1 km/h	• 180.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks", page 7 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0444 EVAP System Purge Control Valve "A" Circuit Open	EVAP Purge Valve Open Circuit	• Signal voltage > 4.40 – 5.40 V	• EVAP purge valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0455 EVAP System Leak Detected - Large Leak	EVAP System Large Leak Pressure Check	• Time for pressure drop < 0.95 s	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Air temperature drop after engine start < 8 K • Intake manifold vacuum > -2,560.0 hPa • Altitude < 2,700.0 m • Vehicle speed >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Restart temperature difference > 52 K • Evap purge valve closed • LDP active • Deep down hill driving • Delta ambient pressure < 7.03 hPa • Or • Engine load not < 19.5 – 45.0% • And • Delta vehicle speed not >= -1 km/h	• 180.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks", page 7 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0456 EVAP System Leak Detected (Very Small Leak)	EVAP System Very Small Leak Pressure Check	• Time for pressure drop < 5.8 s	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Air temperature drop after engine start < 3 K • Intake manifold vacuum > -2,560.0 hPa • Altitude < 2,700.0 m • Vehicle speed 0 – 140 od. >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Restart temperature difference > 52 K • Evap purge valve closed • LDP active • Hill driving • Delta ambient pressure -8.0 – 2.0 hPa • Or • Engine load not < 19.5 – 45.0% • And • Delta vehicle speed not >= -1 km/h • Additional: • Vehicle acceleration < 3.80 m/s2 • Delta engine load < 767.98%/seg	• 180.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks", page 7 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0458 EVAP System Purge Control Valve "A" Circuit Low	EVAP Purge Valve Short To Ground	• Signal voltage < 2.15 – 3.25 V	• EVAP purge valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 .
P0459 EVAP System Purge Control Valve "A" Circuit High	EVAP Purge Valve Short To Battery Plus	• Signal current > 2.2 A	• EVAP purge valve commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0491 AIR System Insufficient Flow Bank 1	Air System Flow Check During Catalyst Heating	• SAI pressure measured with SAI pressure sensor vs. modeled < 50.0 – 72.0% • Or • Absolute deviation of raw pressure signal from filtered signal: mean value < 1.5 – 9.0 hPa	• Mass air flow 7.0 – 120.0 kg/h • Delta engine load -10.0 – 10.0%/rev • ECT 5 – 108° C • IAT 5 – 100° C • Altitude < 2,700.0 m • SAI pressure sensor ready	• 45.0 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 . – Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .
P0501 Vehicle Speed Sensor "A" Circuit Range/ Performance	Vehicle Speed Plausibility Check	• Vehicle speed < 6 km/h	• Engine speed > 2,800 RPM • Engine torque > 120.0 Nm • Vehicle speed sensor no fault	• 10.5 s • Multiple	• 2 DCY	– Check the vehicle speed signal. Refer to ⇒ V3.6.29 ehicle Speed Signal, Checking", page 729 . – Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0506 Idle Control System RPM - Lower Than Expected	Idle Controller Out Of Range Low	• Engine speed deviation < -100 RPM • And • RPM controller torque value >= calculated max value.	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT > -48 °C • IAT > -48 °C • Vehicle speed ready • Evap purge valve closed • External torque request not demanded • For manual transmission: • Engine load < 34.5%	• 7.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0507 Idle Control System RPM - Higher Than Expected	Idle Controller Out Of Range High	• Engine speed deviation > 100 RPM • And • RPM controller torque value <= calculated min. value • Or • RPM controller P-portion and I-portion < -20.0 Nm	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT > -48 °C • IAT > -48 °C • Vehicle speed ready • Evap purge valve closed • External torque request not demanded	• 7.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P050A Cold Start Idle Control System Performance	Cold Start Monitoring Idle Controller Out of Range Low	• Engine speed deviation < -100 RPM • And • RPM controller torque value >= calculated max. value	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT @ start < 143° C • IAT > -48° C • EVAP purge valve closed • External torque request not demanded • Catalyst heating active • For manual transmission: • Engine load < 34.5%	• 5.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
	Cold Start Monitoring Idle Controller Out of Range High	• Engine speed deviation > 100 RPM • RPM controller torque value <= calculated min. value • RPM controller P-portion and I-portion < -20.0 Nm	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT @ start < 143° C • IAT > -48° C • EVAP purge valve closed • External torque request not demanded • Catalyst heating active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P052A Cold Start "A" Camshaft Position Timing Over-Advanced Bank 1	Cold Start Monitoring VVT Actuator Intake Target Error	• Difference between target position vs. actual position > 10° CRK	• Time after engine start >= 10.0 s • Engine speed >= 400 RPM • Modeled oil temperature >= -48° C • Catalyst heating active	• 5.0 s • Once / DCY	• 2 DCY	– Check engine oil for incorrect viscosity or in need of servicing (dirty oil). Oil that is not clear in color may be causing the sensor to operate incorrectly. The engine oil must be clean and of the correct viscosity in order for the sensor to operate properly. Check the vehicle paperwork to determine what oil viscosity has been used and when the last oil change was performed. Change the engine oil if necessary. – Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 .
P0606 ECM/PCM Processor	Oxygen Sensors Heater Front Out Of Range	• Difference between measured calibration resistance in ECM and set value > 45.0 Ω	• Time after engine start > 40.0 s • Engine speed idle	• 40.0 s • Multiple	• 2 DCY	– Replace the Engine/Motor Control Module -J623-. Refer to appropriate repair manual.
	Altitude Sensor Plausibility Check	• Signal gradient > 50.0 hPa		• 20.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Signal gradient < -50.0 hPa				
	Altitude Sensor Short To Ground	• Signal voltage < 0.20 V		• 0.2 s • Multiple		
	Altitude Sensor Short To Battery / Open Circuit	• Signal voltage > 4.88 V				
	ECM: WDA Function Monitoring: WDA	• General cause failure		• 0.5 s • Continuous		
		• Internal check failure				
		• Overvoltage detection failure				
	ECM: EEPROM Check	• Check failed				
	ECM: Self Check For Sensor IC internal Hardware Check (Electrical Adjustment Communication, Voltage Supply)	• Check				
	ECM: 5V Supply Voltage Internal Hardware Check	• Under-/overvoltage detection				
	ECM: A/D Converter Power-Up Calibration	• Check failed	• Initialization phase active			
	ECM: A/D Converter Adc-Cannel Conversion		• Initialization phase active • Power-up calibration executed			
	ECM: EGAS Module Function Monitoring: A/D Converter	• Comparison reference voltage with sensor voltage incorrect				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Test voltage check failed				
		• Internal check failed				
	ECM: EGAS Module Function Monitoring: Torque	• Comparison with allowed engine torque incorrect	• Internal engine speed > 600 RPM			
	ECM: EGAS Module Function Monitoring: Engine Speed Deviation	• Difference between calculated and internal engine speed > 320 RPM	• Internal engine speed > 520 RPM			
	ECM: EGAS Module Function Monitoring: Coding	• Internal check failed				
	ECM: EGAS Module Function Monitoring: Ignition Timing					
	ECM: EGAS Module Function Monitoring: Intern	• System reaction incorrect				
	ECM: EGAS Module Function Monitoring: Injection Rate Limitation					
	ECM: EGAS Module Function Monitoring: Accelerator Position	• Internal check failed				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	ECM: EGAS Module Monitoring Module	• Function controller check failed • And • Monitoring module check no failure	• SPI - interface no failure			
	CAN: Internal Fault CAN Controller RAM Check	• RAM error memory checksum error	• Initialization phase • Time after ignition on 500.0 ms	• 0.0 ms • Once / DCY		
P0627 Fuel Pump "A" Control Circuit/ Open	Fuel Pump Relay Open Circuit	• Signal voltage 4.50 – 5.50 V	• Pump relay commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 .
	Fuel Pump Relay Short To Ground	• Signal voltage < 3.0 V				
P0629 Fuel Pump "A" Control Circuit High	Fuel Pump Relay Short To Battery Plus	• Signal current 0.60 – 1.20 A	• Pump relay commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0638 Throttle Actuator Control Range/ Performance Bank 1	Throttle Actuator Basic Settings Rationality Check Close Movement	• Time to close to reference point > 0.6 s • And • Reference point 2.88%	• Engine speed 0 RPM • Vehicle speed 0 km/h • ECT > -20° C • IAT > -20° C • Case 1: • Ignition on • Case 2: • Engine shut-off-time 3.0 s • Number of checks 2.0 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
	Throttle Actuator Basic Settings Signal Range Check @ Mechanical Stop Low	• TPS 1 signal voltage not (0.40 – 0.80) V • Or • TPS 2 signal voltage not (4.20 – 4.60) V • Or • TPS1 + TPS2 not (4.82 – 5.18) V	• Engine speed 0 RPM • Vehicle speed 0 km/h • Case 1: • Ignition on • ECT -20 – 115° C • IAT -20 – 143° C • Case 2: • Engine shut-off-time 3.0 s • ECT 5 – 115° C • IAT 5 – 143° C	• 0.3 s • Multiple		
P0641 Sensor Reference Voltage "A" Circuit/ Open	ECM: Sensor Reference Circuit A Signal Range Check	• Signal voltage deviation > +/- 0.3 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/ Motor Control Module -J623-. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0651 Sensor Reference Voltage "B" Circuit/ Open	ECM: Sensor Reference Circuit B Signal Range Check	• Signal voltage deviation > +/- 0.3 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/ Motor Control Module -J623-. Refer to appropriate repair manual.
P0697 Sensor Reference Voltage "C" Circuit/ Open	ECM: Sensor Reference Circuit C Signal Range Check	• Signal voltage deviation > +/- 0.3 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/ Motor Control Module -J623-. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P117A Bank 1, Oxygen Sensor Correction Center Sensor Control Limit Reached	Fuel System Out Of Range	• I - portion of 3rd lambda control loop > 0.03 [-]	• Engine speed 1,400 – 3,600 RPM • Modeled exhaust gas temp 350 – 1,000° C • Engine load 20.3 – 54.8% • Lambda control closed loop • 2nd lambda control closed loop • 3rd lambda control closed loop • O2S rear ready • Electrical check ready • O2S heater rear ready no fault	• 1,800.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)”, page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking”, page 713 .
P150A Engine Off Timer Performance	Engine-Off-Time Comparison Of Engine Off Time From Instrument Cluster Control Unit With Engine After Run Time	• Difference between engine-off-time and ECM after-run time < -12.0 s	• Key on after ECM after run time active • CAN active	• 6.0 s • Once / DCY	• 2 DCY	– If ignition off B+ is lost to ECM, this code will set. Check power and ground inputs to ECM first. Refer to Wiring Diagrams for pin locations. If all power/grounds to ECM are

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Difference between engine-off-time and ECM after-run time > 12.0 s	• Key on during ECM after run time active • CAN active			present, replace the Engine/ Motor Control Module -J623-. Refer to appropriate repair manual.
P2088 "A" Camshaft Position Actuator Control Circuit Low Bank 1	VVT Actuator Intake Short To Ground	• Signal voltage < 2.15 – 3.25 V	• Camshaft valve off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 .
P2089 "A" Camshaft Position Actuator Control Circuit High Bank 1	VVT Actuator Intake Short To Battery Plus	• Signal current > 2.2 A	• Camshaft valve on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2096 Post Catalyst Fuel Trim System Too Lean Bank 1	Fuel System Out Of Range	• I-portion of 2nd lambda control loop < -0.040 [-] (CBTA) • I-portion of 2nd lambda control loop < -0.030 [-] (CBUA)	• Modeled exhaust gas temp. 400 – 1,000° C • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • Lambda control not at min or max limit • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front active • O2S heater rear active • Fuel cut off not active • Catalyst heating not active • SAI not active	• 140.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2097 Post Catalyst Fuel Trim System Too Rich Bank 1	Fuel System Out Of Range	• I-portion of 2nd lambda control loop > 0.040 [-] (CBTA) • I-portion of 2nd lambda control loop > 0.030 [-] (CBUA)	• Modeled exhaust gas temp. 400 – 1,000° C • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • Lambda control not at min or max limit • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front active • O2S heater rear active • Fuel cut off not active • Catalyst heating not active • SAI not active	• 140.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .
P2101 Throttle Actuator "A" Control Motor Circuit Range/ Performance	Throttle Actuator Rationality Check	• Deviation throttle value angles vs calculated value > 4.0 – 50.0%		• 0.5 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
	Throttle Actuator Signal Range Check	• Duty cycle > 80.0% • And • ECM power stage no failure		• 5.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2106 Throttle Actuator Control System - Forced Limited Power	Throttle Actuator Open Circuit	• Internal check	• Duty cycle > 80.0% • Or • Deviation throttle value angle vs. calculated value > 4.0 – 50.0%	• 12.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
	Throttle Actuator Functional Check	• Internal check failed				
	Throttle Actuator Temperature / Current Monitoring					
	Throttle Actuator Short To Battery Plus / Short To Ground	• Internal check				
P2122 Throttle/ Pedal Position Sensor/ Switch "D" Circuit Low	Accelerator Position Sensor 1 Out Of Range Low	• Signal voltage < 0.6 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .
P2123 Throttle/ Pedal Position Sensor/ Switch "D" Circuit High	Accelerator Position Sensor 1 Out Of Range High	• Signal voltage > 4.8 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .
P2127 Throttle/ Pedal Position Sensor/ Switch "E" Circuit Low	Accelerator Position Sensor 2 Out Of Range Low	• Signal voltage < 0.3 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2128 Throttle/ Pedal Position Sensor/ Switch "E" Circuit High	Accelerator Position Sensor 2 Out Of Range High	• Signal voltage > 2.4 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .
P2138 Throttle/ Pedal Position Sensor/ Switch "D"/"E" Voltage Correlation	Accelerator Position Sensor 1 And 2 Rationality Check	• Signal voltage sensor 1 vs. 2 > 0.167 – 0.703 V	• Signal voltage sensor 1 > 445.0 mV • Signal voltage sensor 2 > 445.0 mV	• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2177 System Too Lean Off Idle Bank 1	Fuel System Too Lean @ Part Load	• Adaptive value > 28.0%	• Time after engine start n.a. • Engine speed 1,320 – 4,600 RPM • Engine load 25.0 – 46.0% • Mass air flow 45.0 – 300.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Lambda control closed loop • Evap purge valve closed • If low fuel signal then wait until fuel consumption n.a.	• 25.0 s • Multiple	• 2 DCY	– Check the vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking”, page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2178 System Too Rich Off Idle Bank 1	Fuel System Too Rich @ Part Load	• Adaptive value < -28.0%	• Time after engine start n.a. • Engine speed 1,320 – 4,600 RPM • Engine load 25.0 – 46.0% • Mass air flow 45.0 – 300.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Lambda control closed loop • Evap purge valve closed	• 25.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						Manifold Sensor GX9, Checking”, page 698 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking”, page 688 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2181 Cooling System Performance	Coolant System Performance Cooling System Performance Not In A Expect Range	• Thers_03: • Cooling system temperature to low after a sufficient air mass flow integral 75° C	• Thres_01: • Begin of air mass integration when engine temp. 30° C • Thers_02: • ECT @ start -10 – 60° C • AAT > -10° C • Fuel cut off not active • And • Engine load 14.0 – 95.0% • Air mass_01: • Integrated air mass depending on engine temp. at start and AAT 4.0 – 13.5 kg/h (CBTA) • Integrated air mass depending on engine temp. at start and AAT 4.0 – 13.47 kg/h (CBUA) • Depending on temp. at engine start and min. observed AAT for longer than 120.0 – 180.0 s • Depending on temp. at engine start and min. observed AAT for more than 4.0 – 12.0 kg • At time of fault decision: • Average air mass flow 35.0 – 280.0 kg/h • Average vehicle speed 30 – 120 km/h	• 2.0 s • Once / DCY	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2184 Engine Coolant Temperature Sensor 2 Circuit Low	Fan Control Coolant Temperature Sensor Short To Ground	• ECT outlet > 140° C		• 2.0 s • Continuous	• 2 DCY	– Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .
P2185 Engine Coolant Temperature Sensor 2 Circuit High	Fan Control Coolant Temperature Sensor Short To Battery / Open Circuit	• ECT outlet < -40° C		• 2.0 s • Continuous	• 2 DCY	– Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2187 System Too Lean at Idle Bank 1	Fuel System Too Lean @ Idle	• Adaptive value > 5.02%	• Time after engine start n.a. • Engine speed < 860 RPM • Mass air flow < 35.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Delta part load adaptation ready • Lambda control closed loop • Evap purge valve closed • If low fuel signal then wait until fuel consumption n.a.	• 40.0 s • Multiple	• 2 DCY	– Check the vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2188 System Too Rich at Idle Bank 1	Fuel System Too Rich @ Idle	• Adaptive value < -5.02%	• Time after engine start n.a. • Engine speed < 860 RPM • Mass air flow < 35.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Delta part load adaptation ready • Lambda control closed loop • Evap purge valve closed • If low fuel signal then wait until fuel consumption n.a.	• 40.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking”, page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking”, page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						Manifold Sensor GX9, Checking", page 698 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2195 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 1	Oxygen Sensors Front Out Of Range	• Delta lambda of 2nd lambda control loop > 0.065 [-] (CBTA) • Delta lambda of 2nd lambda control loop > 0.070 [-] (CBUA)	• Modeled exhaust gas temp 400 – 1,000° C • Delta engine load < 12.0% • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front ready • O2S heater rear ready • Fuel cut off not active • Catalyst heating not active • SAI not active • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V	• 100.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2196 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 1	Oxygen Sensors Front Out Of Range	• Delta lambda of 2nd lambda control loop < -0.065 [-] (CBTA) • Delta lambda of 2nd lambda control loop < -0.070 [-] (CBUA)	• Modeled exhaust gas temp 400 – 1,000° C • Delta engine load < 12.0% • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front ready • O2S heater rear ready • Fuel cut off not active • Catalyst heating not active • SAI not active • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V	• 100.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2237 O2 Sensor Positive Current Control Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Pump Current (IP)	• O2S signal front < 1.70 V • And • Fuel cutoff > 3.0 s	• O2S ceramic temp > 720° C • Electrical adjustment not active • Heater control closed loop • Evap purge valve ready	• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
		• O2S signal front 1.49 – 1.51 V • And • Delta lambda controller > 0.10 [-]	• O2S ceramic temp > 720° C • Lambda modulation > 0.02 [-] • Lambda control closed loop • Heater control closed loop	• 6.5 s • Multiple		
P2243 O2 Sensor Reference Voltage Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Nernst Voltage (UN)	• O2S signal front > 4.70 V • And • Internal resistance > 950.0 Ω	• Heater control active	• 25.5 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
		• O2S signal front < 0.20 V • And • Internal resistance > 950.0 Ω				
P2251 O2 Sensor Negative Current Control Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Virtual Mass (VM)	• O2S signal front 1.47 – 1.53 V • And • Internal resistance > 950.0 Ω	• Modeled exhaust gas temp < 750 Ω • No fuel cutoff > 2.0 s • Heater control active	• 30.5 s	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2257 AIR System Control "A" Circuit Low	Air Pump Relay Short To Ground	• Signal voltage < 3.0 V	• Pump relay commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .
P2258 AIR System Control "A" Circuit High	Air Pump Relay Short To Battery Plus	• Signal current 0.60 – 1.20 A	• Pump relay commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .
P2270 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF Stuck Lean (If Sensor Stuck Lean: 30.0% Enrichment) (CBTA)	• O2S signal rear not oscillating at reference < 600.0 mV	• Mass air flow 22.0 – 120.0 kg/h (CBTA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 30.0 s (CBTA) • 2nd lambda control closed loop	• 210.0 s (CBTA) • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear 2 - Point - LSF Stuck Lean (If Sensor Stuck Lean: 20.0 - 30.0% Closed Loop Enrichment) (CBUA)		• Mass air flow 30.0 – 120.0 kg/h (CBUA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 10.0 s (CBUA) • 2nd lambda control closed loop	• 80.0 s (CBUA) • Multiple		– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .
P2271 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF Stuck Rich (If Sensor Stuck Rich: 7.0% Enleanment) If Enleanment Is Not Successful: Waiting For Next Fuel Cut Off (CBTA)	(CBTA) • O2S signal rear not oscillating at reference > 600.0 mV	(CBTA) • Mass air flow 22.0 – 120.0 kg/h (CBTA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 30.0 s (CBTA) • Fuel cut off > 3.0 s • 2nd lambda control closed loop	• 210.0 s (CBTA) • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear (Binary Check Of Response Time At Fuel Cut Off (CBTA)	(CBTA) • Response time at fuel cut off > 6.0 s • And • Measurement range from fuel cut off to voltage threshold <= 191.0 mV • And • Number of checks (initial phase) >= 1.0 [-] • Or • Measurement range from fuel cut off to O2 mass flow threshold >= 7,000.0 mg • And • Number of checks (initial phase) >= 1.0 [-]	(CBTA) • Rich voltage (enable) >= 548.0V • Lean voltage <= 191.0V • O2S rear ready • Rear O2-sensor signal oscillating • Monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2-Sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131,070.0 Ω	• 6.0 s (CBTA) • Multiple		
	Oxygen Sensors Rear 2 - Point - LSF Stuck Rich (If Sensor Stuck Rich: 7.0% - 15.0% Closed Loop Enleanment) If Enleanment Is Not Successful: Waiting For Next Fuel Cut Off (CBUA)	(CBUA) • O2S signal rear not oscillating at reference > 600.0 mV	(CBUA) • Mass air flow 30.0 – 120.0 kg/h (CBUA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 10.0 s (CBUA) • Fuel cut off > 3.0 s • 2nd lambda control closed loop	• 80.0 s (CBUA) • Multiple		– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)”, page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear (Binary LSF) Check Of Response Time At Fuel Cut Off (CBUA)	(CBUA) • Response time at fuel cut off > 6.0 s • And • Measurement range from fuel cut off to voltage threshold <= 191.0 mV • And • Number of checks (initial phase) >= 1.0 [-] • Or • Measurement range from fuel cut off to O2 mass flow threshold >= 4,000.0 mg • And • Number of checks (initial phase) >= 1.0 [-]	(CBUA) • Rich voltage (enable) >= 548.0V • Lean voltage n.a. • O2S rear ready • Rear O2-sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131,070.0 Ω	• 4.5 s (CBUA) • Multiple		
P2274 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF Stuck Lean (If Sensor Stuck Lean: 30.0% Enrichment)	• O2S signal rear not oscillating at reference < 600.0 mV	• Mass air flow 22.0 – 120.0 kg/h • Modeled exhaust gas temp. > 350° C • O2S rear readiness > 30.0 s • 2nd lambda control closed loop	• 210.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)”, page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2275 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF Stuck Rich (If Sensor Stuck Rich: 7.0% Enleanment) If Enleanment Is Not Successful: Waiting For Next Fuel Cut Off	• O2S signal rear not oscillating at reference > 600.0 mV	• Mass air flow 22.0 – 120.0 kg/h • Modeled exhaust gas temp. > 350° C • O2S rear readiness > 30.0 s • Fuel cut off active • 2nd lambda control closed loop	• 210.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .
	Oxygen Sensors Rear (Binary LSF) Check Of Response Time At Fuel Cut Off	• Response time at fuel cut off > 6.0 s • And • Measurement range from fuel cut off to voltage threshold <= 191.0 mV • And • Number of checks (initial phase) >= 1.0 [-] • Or • Measurement range from fuel cut off to O2 mass flow threshold >= 7,000.0 mg • And • Number of checks (initial phase) >= 1.0 [-]	• Rich voltage (enable) >= 548.0V • Lean voltage n.a. • O2S rear ready • Rear O2 - sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131,070.0 Ω	• 4.5 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2279 MAP/ MAF - Throttle Position Correlation	Leak to Intake Manifold Adaptation Value Monitoring	• Offset value throttle mass flow > 13.0 kg/h	• Desired mass flow 0.0 – 25.0 kg/h • EVAP purge valve closed • EGR off	• 10.0 s • Multiple	• 2 DCY	• Check for air leaks near the throttle body, oil fill cap not tight or oil dipstick not seated in tube. Also check for any engine gaskets that can cause additional air to enter the crankcase can set this fault as the PCV system is not metered. If a vacuum leak or crankcase seal is the cause, the idle may be rough or unstable. – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 . – Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regu-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						lator Valve 1 N80, Checking", page 688 .
P2300 Ignition Coil "A" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2301 Ignition Coil "A" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2303 Ignition Coil "B" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2304 Ignition Coil "B" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2306 Ignition Coil "C" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2307 Ignition Coil "C" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2309 Ignition Coil "D" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2310 Ignition Coil "D" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2312 Ignition Coil "E" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2313 Ignition Coil "E" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2400 EVAP System Leak Detection Pump Control Circuit/ Open	LDP Open Circuit	• Signal voltage > 4.40 – 5.60 V	• LDP commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2401 EVAP System Leak Detection Pump Control Circuit Low	LDP Short To Ground	• Signal voltage < 2.15 – 3.25 V	• LDP commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .
P2402 EVAP System Leak Detection Pump Control Circuit High	LDP Short To Battery Plus	• Signal current > 3.0 A	• LDP commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2403 EVAP System Leak Detection Pump Sense Circuit/ Open	Reed Sensor Rationality Check Unable To Close	• Low signal voltage > 0.5 s	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Altitude < 2,700.0 m • Integrated purge flow > 29.90 g • Restart temperature difference > 52 K • Vehicle speed >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Evap purge valve ready • LDP commanded off	• 0.5 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .
P2404 EVAP System Leak Detection Pump Sense Circuit Range/ Performance	Reed Sensor Rationality Check Unable To Open	• High signal voltage > 12.0 s • And • Number of checks 30.0 [-]	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Altitude < 2,700.0 m • Intake manifold vacuum > -2,560.0 hPa • Restart temperature difference > 52 K • Vehicle speed >= 0 km/h	• 12.0 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Cumulative time of high signal voltage during pumping > 10.0 s	• Vehicle speed ones > 30 km/h • Selected gear any drive • Evap purge valve closed, ready • LDP commanded on	• 120.0 s • Once / DCY		
P240A EVAP System Leak Detection Pump Heater Control Circuit/ Open	EVAP Leak Detection Pump Open Circuit	• Signal voltage > 4.7 – 5.4 V	• Evap pump heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 , as applicable.
P240B EVAP System Leak Detection Pump Heater Control Circuit Low	EVAP Leak Detection Pump Short To Ground	• Signal voltage < 2.74 – 3.26 V	• Evap pump heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 , as applicable.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P240C EVAP System Leak Detection Pump Heater Control Circuit High	EVAP Leak Detection Pump Short To Battery Plus	• Signal current > 2.2 – 4.0 A	• Evap pump heater commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 , as applicable.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2407 EVAP System Leak Detection Pump Sense Circuit Intermittent/ Erratic	EVAP Leak Detection Pump Signal Check During Engine Off	• Fluctuation of evap pump current during reference measurement > 1 mA • Or • Drop of evap pump current during pump phase > 6 mA • For time >= 3.0 s	• Engine temperature @ engine start >= 4° C • Difference between ECT and IAT @ engine start <= 15 K • Ambient air temperature < 35; > 4° C • Altitude <= 2700 m • Time since engine start in preceding dcy >= 600.0 s • Change in battery voltage during monitoring < 1.0 V • Engine off time >= 5.0 s • Vehicle speed 0 km/h • Evap purge adaptation < 5.0 [-] • Deviation of filtered evap pump current during reference measurement within range <= 1 mA • Change in relative evap pump current during monitoring n.a. • Within time n.a. • (During ECM keep alive-time after ignition off, max. time) < 900.0 s • Airbag not activated • (After MIL illumination because of any EVAP leakage the monitor is only activated every) 1 dcys	• 800.0 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 , as applicable.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2414 O2 Sensor Exhaust Sample Error Bank 1 Sensor 1	Oxygen Sensors Front Signal Range Check (Check For Sensor At Ambient Air)	• Threshold 1: • Signal voltage 3.10 – 4.77 V • Threshold 2: • Signal voltage 2.50 – 3.06 V • Depending on gain factor that actual is used for sensor	• Lambda value < 1.6 [-] • O2S ceramic temp. > 715°C • Fuel cut off not active • Heater control closed loop • SAI not active • If low fuel signal then wait > 0.0 s	• 15.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
P2431 AIR System Air Flow/Pressure Sensor Circuit Range/Performance Bank 1	Air System Pressure Sensor Rationality Check	• Difference between SAI pressure and ambient pressure not (-60.0 – 60.0 hPa	• SAI done	• 0.5 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Sensor 1 - G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 .
P2432 AIR System Air Flow/Pressure Sensor Circuit Low Bank 1	Air System Pressure Sensor Signal Range Check	• Signal voltage < 0.5 V		• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Sensor 1 - G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 .
P2433 AIR System Air Flow/Pressure Sensor Circuit High Bank 1	Air System Pressure Sensor Signal Range Check	• Signal voltage > 4.5 V		• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Sensor 1 - G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2440 AIR System Switching Valve Stuck Open Bank 1	Air System Check After SAI	• SAI pressure measured with SAI pressure sensor vs. modeled while SAI valve closed < 65.0%	• ECT 5 – 108° C • IAT 5 – 100° C • Altitude < 2,700.0 m • SAI pressure sensor ready	• 45.0 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve -N112-. Refer to ⇒ S3.6.26 econdary Air Injection Solenoid Valve N112, Checking", page 723 . – Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2450 EVAP System Switching Valve Performance/ Stuck Open	EVAP Leak Detection Pump Rationality Check During Engine Off	• Evap pump current difference between reference measurement to idle <= 3 mA	• Engine temperature @ engine start >= 4° C • Difference between ECT and IAT @ engine start <= 15 K • Ambient air temperature < 35; > 4° C • Altitude <= 2,700 m • Time since engine start in preceding dcy >= 600.0 s • Change in battery voltage during monitoring < 1.0 V • Engine off time >= 5.0 s • Vehicle speed 0 km/h • Evap purge adaptation < 5.0 [-] • No sudden change in evap pump current (filling event) < 2; > -1 mA • Deviation of filtered evap pump current during reference measurement within range <= 1.0 mA • Change in relative evap pump current during monitoring n.a. • Within time n.a. • (During ECM keep alive-time after ignition off, max. time) < 900.0 s • Airbag not activated • (After MIL illumination because of any EVAP leakage the mon-	• 13.5 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 , as applicable.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
			itor is only activated every) 1 dcys			
P2626 O2 Sensor Pumping Current Trim Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Adjustment Voltage (IA)	• O2S signal front > 4.77 V	• Modeled exhaust temp. < 750° C • O2S ceramic temp. > 720° C • Fuel cut off active • Heater control closed loop • If low fuel signal then wait > 0.0 s	• 2.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
P3081 Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	Engine Coolant Temperature Sensor Rationality Measured Engine Coolant Temp. Below Reference Model	• Range_01: • Measured engine coolant temp. not within in a range of the reference model > 11 K	• Modmax_01: • Maximum reference temperature 60° C	• 4.0 s • Multiple	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 .
U0001 High Speed CAN Communication Bus	CAN: CAN-Bus Reading Back Sent Message (Powertrain)	• CAN message no feedback	• Time after ignition on 500.0 ms	• 250.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .
U0002 High Speed CAN Communication Bus Performance	CAN: CAN-Bus CAN Communication Check (Powertrain)	• Global time out receiving no message	• Time after ignition on 500.0 ms	• 450.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
U0101 Lost Communication with TCM	CAN: TCM CAN Communication With TCM	• Received CAN message no message	• Time after ignition on 500.0 ms	• 500.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance between the Transmission Control Module to the Engine/ Motor Control Module - J623-. Refer to ⇒ C3.6.5 AN-Bus Terminal Resistance, Powertrain, Checking", page 678 .
U0121 Lost Communication With Anti-Lock Brake System (ABS) Control Module "A"	CAN: Brake Unit CAN Communication With Brake Unit	• Received CAN message no message	• Time after ignition on 500.0 ms	• 440.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .
U0146 Lost Communication With Gateway "A"	CAN: Gateway CAN Communication With Gateway	• Received CAN message no message	• Time after ignition on 500.0 ms	• 1,000.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
U0155 Lost Communication With Instrument Panel Cluster (IPC) Control Module	CAN: Instrument Cluster CAN Communication With Instrument Cluster Module	• Received CAN message no message	• Time after ignition on 500.0 ms	• 500.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .
U0302 Software Incompatibility With Transmission Control Module	CAN: TCM CAN Communication With TCM	• Received AT vehicle data TCM signal	• Time after ignition on 500.0 ms	• 100.0 ms • Continuous	• 2 DCY	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Transmission Control Module. Refer to appropriate repair manual.
U0402 Invalid Data Received From TCM	CAN: TCM CAN Communication With TCM	• Received data implausible message	• Time after ignition on 500.0 ms	• 60.0 ms • Continuous	• 2 DCY	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Transmission Control Module. Refer to appropriate repair manual.
U0415 Invalid Data Received From Anti-Lock Brake System (ABS) Control	CAN: Vehicle Speed Sensor CAN Communication With Vehicle Speed Sensor	• Speed sensor signal: initialization error 327.08 km/h • Speed sensor signal: low voltage error 327.25 km/h		• 1,980.0 ms	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 . – Check the vehicle

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
Module "A"		• Speed sensor signal: sensor error 327.42 km/h		• 480.0 ms • Continuous		speed signal. Refer to ⇒ V3.6.29 ehicle Speed Signal, Checking", page 729 .
		• Vehicle speed >= 325 km/h		• 2,100.0 ms • Continuous		
		• Speed sensor signal: out of range 326.39 km/h		• 480.0 ms • Continuous		
	CAN: Brake Unit CAN Communication With Brake Unit	• Received data implausible message	• Time after ignition on 500.0 ms	• 60.0 ms • Continuous		
U0422 Invalid Data Received From Body Control Module	CAN: Ambient Air Temperature Sensor Communication With Instrument Cluster Module	• Ambient temperature value (initialization) 0.0 h [-]	• Key on • Status ambient temperature from instrument cluster no fault • Electrical check ambient temperature sensor no fault	• 3.0 s • Multiple	• 2 DCY	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Body Control Module. Refer to appropriate repair manual.
U0423 Invalid Data Received From Instrument Panel Cluster Control Module	CAN: Instrument Cluster CAN Communication With Instrument Cluster Module	• Received CAN message implausible message	• Time after ignition on 500.0 ms	• 600.0 ms • Continuous	• 2 DCY	– Check for correct software version and VIN or update software for the IPC Module if available. If OK, replace the Instrument Cluster Control Module -J285-. Refer to appropriate repair manual.
	CAN: Ambient Air Temperature Sensor Communication With Instrument Cluster Module (CBTA)	• Ambient temperature value (initialization) 0.0 h [-]	• Key on • Status ambient temperature from instrument cluster no fault • Electrical check ambient temperature sensor no fault	• 3.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
U0447 Invalid Data Received From Gateway "A"	CAN: Gateway CAN Communication With Gateway	• Received data implausible message	• Time after ignition on 500.0 ms	• 300.0 ms • Continuous	• 2 DCY	Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking”, page 676 .

3.4.3 Engine/Motor Control Module, 2012 MY

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P000A "A" Camshaft Position Slow Response Bank 1	VVT Actuator Intake Slow Response	• Difference between target position vs. actual position > 8 – 12° CRK (CBTA) • Difference between target position vs. actual position > 8° CRK (CBUA) • And • Adjustment angle > 3° CRK	• Time after engine start > 1.5 – 3.0 s • Engine speed 600 – 6,320 RPM • Oil temperature -48 – 143° C • Frequency (normal operation) 7.0 times [-] (CBTA) • Frequency (normal operation) 4.0 times [-] (CBUA) • Or (CBTA) • Frequency (CSM) 1.0 times [-] (CBTA)	• 21.0 (CBTA) • 12.0 s (CBUA) • Multiple	• 2 DCY	– Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking”, page 672 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking”, page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking”, page 686 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0010 "A" Camshaft Position Actuator "A" Control Circuit/ Open Bank 1	VVT Actuator Intake Open Circuit	• Signal voltage > 4.40 – 5.60 V	• Camshaft valve off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0011 "A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	VVT Actuator Intake Target Error	• Difference between target position vs. actual position > 8 – 12° CRK (CBTA) • Difference between target position vs. actual position > 8° CRK (CBUA) • And • Adjustment angle > 3° CRK	• Time after engine start > 1.5 – 3.0 s • Engine speed 600 – 6,320 RPM • Oil temperature -48 – 143° C • Frequency (normal operation) 7.0 times [-] (CBTA) • Frequency (normal operation) 4.0 times [-] (CBUA) • Or (CBTA) • Frequency (CSM) 1.0 times [-] (CBTA)	• 21.0 (CBTA) • 12.0 s (CBUA) • Multiple	• 2 DCY	– Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0016 Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	Camshaft Position Sensor Inlet Angular Offset Check	• Permissible deviation < -13.5° CRK • Or • Permissible deviation > 13.5° CRK		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 .
P0030 HO2S Heater Control Circuit Bank 1 Sensor 1	Oxygen Sensors Heater Front Open Circuit	• Heater voltage 2.34 – 3.59 V	• Time after engine start > 5.0 s • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0031 HO2S Heater Control Circuit Low Bank 1 Sensor 1	Oxygen Sensors Heater Front Short To Ground	• Heater voltage < 2.34 V	• Time after engine start > 5.0 s • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
P0032 HO2S Heater Control Circuit High Bank 1 Sensor 1	Oxygen Sensors Heater Front Short To Battery Plus	• Heater voltage > 3.59 V	• Time after engine start > 5.0 s • Heater commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0036 HO2S Heater Control Circuit Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Open Circuit	• Heater voltage 4.50 – 5.50 V	• Engine speed > 80 RPM (CBTA) • Time after engine start > 5.0 s (CBUA) • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0037 HO2S Heater Control Circuit Low Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Ground	• Heater voltage < 3.0 V	• Engine speed > 80 RPM (CBTA) • Time after engine start > 5.0 s (CBUA) • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0038 HO2S Heater Control Circuit High Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Battery Plus	• Heater current 2.70 – 5.50 A	• Engine speed > 80 RPM (CBTA) • Time after engine start > 5.0 s (CBUA) • Heater commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0042 HO2S Heater Control Circuit Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Open Circuit	• Heater voltage 4.50 – 5.50 V	• Engine speed > 80 RPM • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0043 HO2S Heater Control Circuit Low Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Ground	• Heater voltage < 3.0 V	• Engine speed > 80 RPM • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0044 HO2S Heater Control Circuit High Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Battery Plus	• Heater current 2.70 – 5.50 A	• Engine speed > 80 RPM • Heater commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ Õ3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .
P0070 Ambient Air Temperature Sensor Circuit "A"	Ambient Air Temperature Sensor Short To Battery / Open Circuit	• Ambient air temperature < -50° C	• CAN active	• 6.0 s • Multiple	• 2 DCY	– Check the Outside Air Temperature Sensor -G17-. Refer to ⇒ Õ3.6.21 utside Air Temperature Sensor G17, Checking", page 711 . – Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0071 Ambient Air Temperature Sensor Circuit "A" Range/ Performance	Ambient Air Temperature Sensor Range/ Performance	• Diff. ECT vs. IAT at engine start (depending on engine off time) < 24.75° C • And • Diff. IAT vs. AAT at engine start (depending on engine off time) > 24.75° C • And • Diff. AAT vs. ECT at engine start (depending on engine off time) > 24.75° C	• Engine off time > 6.0 h • Blockheater • ECT >= 143° C • Time after engine start 2.0 s • Or • Diff. ECT vs. ECT outlet <= 20° C • Time after engine start 2.0 s • Solar radiation case 1: • AAT @ start <= 2° C • Minus • AAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s • Solar radiation case 2: • IAT @ start <= 2° C • Minus • IAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s	• 60.0 s • Once / DCY	• 2 DCY	– Check the Outside Air Temperature Sensor -G17-. Refer to ⇒ O3.6.21 utside Air Temperature Sensor G17, Checking", page 711 . – Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0072 Ambient Air Temperature Sensor Circuit "A" Low	Ambient Air Temperature Sensor Short To Ground	• Ambient air temperature > 87° C	• CAN active	• 6.0 s • Multiple	• 2 DCY	– Check the Outside Air Temperature Sensor - G17-. Refer to ⇒ O3.6.21 utside Air Temperature Sensor G17, Checking", page 711 . – Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .
P0106 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Range/ Performance	Manifold Pressure Sensor Rationality Check Low	• Difference manifold pressure - lower threshold model < 0.0 hPa • Model range 0.0 – 800.0 hPa	• Time after engine start n.a.	• 450.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 . – Check the Intake Manifold Sensor - GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .
	Manifold Pressure Sensor Rationality Check High	• Difference manifold pressure - lower threshold model > 0.0 hPa • Model range 650.0 – 1,080.0 hPa				
	Manifold Pressure Sensor Rationality Check	• Diff. altitude sensor signal vs. manifold pressure signal at engine start > 60.0 hPa	• Time after engine start < 25.0 s • Engine speed < 330 RPM			
	Manifold Pressure Sensor Adaptation Value Monitoring	• Offset value manifold pressure for load calculation in driving condition range 2.0 > 55.0 hPa	• Driving condition range 1 (omsna): • Engine speed < 800 RPM			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Offset value manifold pressure for load calculation in driving condition range 2.0 < -60.0 hPa	• Desired mass flow 5.0 – 25.0 kg/h • Delta adaptation value range 1.0 < 0.10 kg/h • For time 1.0 s • Driving condition range 2 (opsra): • Engine speed > 1,400 RPM • Manifold pressure < 425.0 hPa • Delta adaptation value range 2.0 < 2.97 hPa • For time 8.0 s • Driving condition range 3 (opua): • Desired mass flow > 40.0 kg/h • Manifold pressure > 550.0 hPa • Delta adaptation value range 3.0 < 2.97 hPa • For time 5.0 s • General: • Engine operation in every driving condition >= 2.0 times • Diagnosis evap purge system not active • Engine speed 500 – 6,000 RPM • Manifold pressure > 0.0 hPa • Ratio manifold pressure to ambient pressure < 0.85 [-]			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0107 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Low	Manifold Pressure Sensor Short To Ground	• Signal voltage < 0.20 V		• 1.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .
P0108 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit High	Manifold Pressure Sensor Short To Battery / Open Circuit	• Signal voltage > 4.86 V		• 1.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0111 Intake Air Temperature Sensor 1 Circuit Range/ Performance Bank 1	Intake Air Temperature Rationality Check	• Diff. ECT vs. IAT at engine start (depending on engine off time) > 24.75° C • And • Diff. IAT vs. AAT at engine start (depending on engine off time) > 24.75° C • And • Diff. AAT vs. ECT at engine start (depending on engine off time) < 24.75° C	• Engine off time > 6.0 h • Blockheater • ECT >= 143° C • Time after engine start 2.0 s • Or • Diff. ECT vs. ECT outlet <= 20° C • Time after engine start 2.0 s • Solar radiation case 1: • AAT @ start <= 2° C • Minus • AAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s • Solar radiation case 2: • IAT @ start <= 2° C • Minus • IAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s	• 60.0 s • Once / DCY	• 2 DCY	– Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 . – Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0112 Intake Air Temperature Sensor 1 Circuit Low Bank 1	Intake Air Temperature Sensor Short To Ground	• IAT > 130° C		• 5.0 s • Multiple	• 2 DCY	– Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 . – Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0113 Intake Air Temperature Sensor 1 Circuit High Bank 1	Intake Air Temperature Sensor Short To Battery / Open Circuit	• IAT < -46° C		• 5.0 s • Multiple	• 2 DCY	– Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 . – Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0116 Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	Engine Coolant Temperature Sensor Stuck Low	• Thres_01[f(ECT)]:Temp_01 • No change on signal 1.5 K	• ECT @ start n.a. • ECT 50 – 75° C • Cold start n.a. • Temp_02 • Substitute ECT > -45° C • Driving condition L: • Vehicle speed 0 – 20 km/h • Mass air flow 4.0 – 40.0 kg/h • Time required / > 10.0 s • Frequency 3.0 times • And • Driving condition H: • Vehicle speed 50 – 150 km/h • Mass air flow 32.0 – 352.0 kg/h • Time required / > 40.0 s • Frequency once	• 70.0 s • Once / DCY	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Engine Coolant Temperature Sensor Stuck High		• Temp_01 • ECT @ start n.a. • ECT 105 – 140° C • Cold start n.a. • Temp_02 • Substitute ECT > -45° C • Driving condition L: • Vehicle speed 0 – 20 km/h • Mass air flow 4.0 – 40.0 kg/h • Time required / > 10.0 s • Frequency 3.0 times • And • Driving condition H: • Vehicle speed 50 – 150 km/h • Mass air flow 32.0 – 352.0 kg/h • Time required / > 40.0 s • Frequency once			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Engine Coolant Temperature Sensor Stuck In Range	• Signal in range 75.0 – 105.0° C • And • No change on signal n. a.	• Cold start detected • Stuck high n.a. • Temp_01 • ECT @ start n.a. • Temp_02 • Substitute ECT n.a. • Driving condition L: • Vehicle speed n.a. • Mass air flow n.a. • time required / n.a. • Frequency n.a. • And • Driving condition H: • Vehicle speed n.a. • Mass air flow n.a. • Time required / n.a. • Frequency n.a.	• 2.0 s • Once / DCY		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0117 Engine Coolant Temperature Sensor 1 Circuit Low	Engine Coolant Temperature Sensor Short To Ground	• ECT > 140° C		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0118 Engine Coolant Temperature Sensor 1 Circuit High	Engine Coolant Temperature Sensor Short To Battery / Open Circuit	• ECT < -40° C		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.
P0121 Throttle/ Pedal Position Sensor/ Switch "A" Circuit Range/ Performance	Throttle Position Sensor 1 Rationality Check	• TPS1-TPS2 > 6.30% • And • • Actual TPS1 - calc. value > actual TPS2 - calc. value • Or • TPS1 - calc. value > 9.0%	• Engine speed > 480 RPM	• 0.3 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0122 Throttle/ Pedal Position Sensor/ Switch "A" Circuit Low	Throttle Position Sensor 1 Out Of Range Low	• Signal voltage < 0.20 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0123 Throttle/ Pedal Position Sensor/ Switch "A" Circuit High	Throttle Position Sensor 1 Out Of Range High	• Signal voltage > 4.81 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0130 O2 Sensor Circuit Bank 1 Sensor 1	Oxygen Sensors Front Out Of Range	• O2S ceramic temp. < 640° C	• Modeled exhaust temp > 300° C • Fuel cut off not active	• 15.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0131 O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	Oxygen Sensors Front Signal Range Check	• Short to ground • Virtual mass (VM) < 1.75 V • Or • Nernst voltage (UN) < 1.50 V • Or • Adjustment voltage (IA) < 0.30 V • Or • Adjustment voltage (IP) < 0.30 V		• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
P0132 O2 Sensor Circuit High Voltage Bank 1 Sensor 1	Oxygen Sensors Front Signal Range Check	• Short to battery • Virtual mass (VM) > 3.25 V • Or • Nernst voltage (UN) > 4.40 V • Or • Adjustment voltage (IA) > 7.0 V • Or • Adjustment voltage (IP) > 7.0 V		• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0133 O2 Sensor Circuit Slow Response Bank 1 Sensor 1	Oxygen Sensors Front Response Rate Monitoring, Area Ratio	• Symmetric fault: • Lower value of both area ratios R2L and L2R < 0.25 [-] (CBTA) • Lower value of both area ratios R2L and L2R < 0.20 [-] (CBUA) • And • Difference of R2L area ratio vs. L2R area ratio -0.40 – 0.40 [-] • Asymmetric fault: • Lower value of both area ratios R2L and L2R < 0.25 [-] (CBTA) • Lower value of both area ratios R2L and L2R < 0.35 [-] (CBUA) • And • Difference of R2L area ratio vs. L2R area ratio not (-0.40 – 0.40) [-] • General: • Lower value of both counters for area ratio R2L and L2R >= 5 times	• O2S front - min. operation temperature is reached > 720° C • O2S front - time since operation readiness > 40.0 s • Engine speed 1,160 – 2,720 RPM • Engine load 13.99 – 45.0% • Gradient of engine load <= 7.99% • Exhaust system lag time calculation 0.15 – 0.33 s • Gradient of exhaust system lag time calculation <= 0.0 s • ECT >= 10° C • Catalyst temperature >= 450° C • Lambda control set-point prior to diagnostic fuel steps A/F-ratio stoichiometric • Relative fuel amount from wall applied compensation and evap purge <= 0.1 [-] • Canister load < 15.0 [-] • Time since last measurement > 3.0 s • 2nd lambda control loop not active • Forced lambda oscillation not active • SAI not active • Tank leakage detection not active	• 67.0 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
			• Diagnosis evap purge system not active • Fuel cut off for any cylinders not active • Open circuit pump current (IP) ready • Only Flex fuel systems without ethanol sensor: • Ethanol concentration adaptation not active			
P0135 O2 Sensor Heater Circuit Bank 1 Sensor 1	Oxygen Sensors Heater Front Out Of Range High	• O2S ceramic temperature < 720° C • And • Heater duty cycle > 100.0%	• Modeled exhaust gas temp. > 550° C • Heater control active	• 70.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
	Oxygen Sensors Heater Front Rationality Check (Sensor Heating Up)	• O2S ceramic temp < 715° C • And • Time after O2S heater on 35.0 s	• ECT at start > -10° C • Engine shutoff time > 120.0 s • During ECM keep alive time (key off) < 500.0 s	• 35.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0136 O2 Sensor Circuit Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Heater Coupling Check)	• Delta voltage one step at heater switching > 2.0 V • And • Number of heater coupling >= 6.0 times [-]	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • For time > 10.0 s • Heater not active • For time > 0.0 s	• 60.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0137 O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Short To Ground, Core Connection Signal Wires)	• Signal voltage < 0.06 V • For time > 3.0 s • And • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) < 0.01 V	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time n.a. (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time n.a. (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • Fuel cut off not active • Catalyst purge not active	• 3.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0138 O2 Sensor Circuit High Voltage Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Out Of Range High (Short To Battery Plus)	• Signal voltage > 1.08 V • For time > 5.0 s	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • Lambda set value > 0.995 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0139 O2 Sensor Circuit Slow Respons e Bank 1 Sensor 2	Oxygen Sensors Rear (Binary LSF) Check Of Transient Time At Fuel Cut Off	• EWMA filtered transient time at fuel cut off > 0.6 s • O2 voltage between 201.0 – 401.0 mV • Number of checks (initial phase) >= 4.0 [-] • Number of checks (step function) >= 3.0 [-]	• Rich voltage (enable) >= 548.0 mV • Lean voltage n.a. • O2S rear ready • Rear O2 - sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131,070.0 Ω • Or • Trigger for step change: delta transient time > 0.3 s	• 4.5 s • Multiple	• 1 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P013A O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	• EWMA filtered max differential transient time at fuel cutoff >= 0.8 s • And • Number of checks >= 1.0 [-]	• Time of fuel cutoff <= 90.0 s • Time after last fuel cutoff >= 5.0 s • Rear O2S ready • Exhaust temp at sensor deviation between actual and expected lambda signal < 8 after time since fuel cutoff at first cylinder >= 2.0 s • Exhaust mass flow >= 12.0 kg/h • Exhaust mass flow dynamic within range -500.0 – 500.0 kg/h • Sensor voltage at start of measurement > 0.45 V • Target voltage end of measurement <= 0.15 V	• 10.0 s	• 1 DCY	– For CBTA: Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – For CBUA: Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0140 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Signal Line Open Circuit)	• Signal voltage 0.40 – 0.60 V • For time > 3.0 s • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3.0 measurements) >= 2.80 V	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded	• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Ground Line Open Circuit)	• Internal resistance > 40,000.0 Ω • And • Exhaust temperature > 670° C	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • Valid Ri-measurements > 10.0 times [-]	• 50.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0141 O2 Sensor Heater Circuit Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Out Of Range	• Heater resistance 1,200.0 – 32,400.0 Ω (CBTA) • Heater resistance 880.0 – 30,400.0 Ω (CBUA)	• Modeled exhaust gas temp. 200 – 680° C • Engine shut-off-time > 120.0 s • (During ECM keep alive-time after ignition off) < 500.0 s (CBTA) • (During ECM keep alive-time after ignition off) < 1,200.0 s (CBUA) • Number of checks 10.0 [-] • Fuel cut off not active • Heater commanded on	• 6.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0142 O2 Sensor Circuit Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Heater Coupling Check)	• Delta voltage one step at heater switching > 2.0 V • And • Number of heater coupling >= 6.0 times [-]	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • For time > 10.0 s • Heater not active • For time > 0.0 s	• 60.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0143 O2 Sensor Circuit Low Voltage Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Short To Ground, Core Connection Signal Wires)	• Signal voltage < 0.06 V • For time > 3.0 s • And • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3.0 measurements) < 0.01 [V]	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time n.a. • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time n.a. • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • Fuel cut off not active • Catalyst purge not active	• 3.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0144 O2 Sensor Circuit High Voltage Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Out Of Range High (Short To Battery Plus)	• Signal voltage > 1.08 V • For time > 5.0 s	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • Lambda set value > 0,995 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0145 O2 Sensor Circuit Slow Response Bank 1 Sensor 3	Oxygen Sensors Rear (Binary LSF) Check Of Transient Time At Fuel Cut Off	• EWMA filtered transient time at fuel cut off > 1.5 s • In voltage range 201.0 – 401.0 mV • Number of checks (initial phase) >= 4.0 [-] • Number of checks (step function) >= 3.0 [-]	• Rich voltage enable >= 548.0 mV • Lean voltage n.a. • O2S rear ready • Rear O2 - sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 - sensor internal resistance <= 131,070.0 Ω • Or • Trigger for step change: delta transient time > 0.3 s	• 4.5 s • Multiple	• 1 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0146 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Signal Line Open Circuit)	• Signal voltage 0.40 – 0.60 V • For time > 3.0 s • And • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3.0 measurements) >= 2.80 V	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded	• 5.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Ground Line Open Circuit)	• Internal resistance > 40,000.0 Ω • And • Exhaust temperature > 670° C	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • Valid Ri-measurements > 10.0 times [-]	• 50.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0147 O2 Sensor Heater Circuit Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Out Of Range	• Heater resistance 1,200.0 – 32,400.0 Ω	• Modeled exhaust gas temp. 200 – 680° C • Engine shut-off-time > 120.0 s • (During ECM keep alive-time after ignition off) < 500.0 s • Number of checks 10.0 [-] • Fuel cut off not active • Heater commanded on	• 6.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .
P0169 Incorrect Fuel Composition	ECM: EGAS Module Function Monitoring: Injection Time	• Comparison with fuel quantity incorrect	• Internal engine speed > 1,200 RPM	• 0.5 s • Continuous	• 2 DCY	– Check for contaminated/aged fuel or possible high concentration of alcohol in fuel (above 15%). Poor quality fuel will also increase consumption. Replace with fresh fuel if believed to be contaminated. Refer to appropriate repair manual. – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒
	ECM: EGAS Module Function Monitoring: Lambda Mode	• Internal check failed				
	ECM: EGAS Module Function Monitoring: Mixture Control	• Correction factor incorrect				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Fuel quantity incorrect				O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – If fuel quality is adequate, replace the Engine/ Motor Control Module. Refer to appropriate repair manual.
P0201 Cylinder 1 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0202 Cylinder 2 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0203 Cylinder 3 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0204 Cylinder 4 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0205 Cylinder 5 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0221 Throttle/ Pedal Position Sensor/ Switch "B" Circuit Range/ Performance	Throttle Position Sensor 2 Rationality Check	• TPS1 - TPS2 > 6.30% • And • • Actual TPS2 - calc. value > actual TPS1 - calc. value • or • TPS2 - calc. value > 9.0%	• Engine speed > 480 RPM	• 0.3 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0222 Throttle/ Pedal Position Sensor/ Switch "B" Circuit Low	Throttle Position Sensor 2 Out Of Range Low	• Signal voltage < 0.20 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0223 Throttle/ Pedal Position Sensor/ Switch "B" Circuit High	Throttle Position Sensor 2 Out Of Range High	• Signal voltage > 4.81 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0261 Cylinder 1 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0262 Cylinder 1 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0264 Cylinder 2 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0265 Cylinder 2 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0267 Cylinder 3 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0268 Cylinder 3 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0270 Cylinder 4 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0271 Cylinder 4 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0273 Cylinder 5 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0274 Cylinder 5 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0300 Random/ Multiple Cylinder Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	⇒ F3.6.13 uel Injectors, Checking”, page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking”, page 696 .
P0301 Cylinder 1 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system me-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	chanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0302 Cylinder 2 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low com-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	pression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0303 Cylinder 3 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)	• Rough road not detected	• 200 rev • Multiple	• Immediately	cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking”, page 696 .
P0304 Cylinder 4 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)	• Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 200 rev • Multiple	• Immediately	visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						Stage, Checking”, page 696 .
P0305 Cylinder 5 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0321 Ignition/ Distributor Engine Speed Input Circuit Range/ Performance	RPM Sensor Rationality Check	• Counted teeth vs. reference incorrect • Or • Monitoring reference gap failure		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 .
P0322 Ignition/ Distributor Engine Speed Input Circuit No Signal	RPM Sensor Signal Activity Check	• Camshaft signals > 5.0 [-] • And • Engine speed no signal		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0324 Knock / Combustion Vibration Control System Error	Knock Control Internal Hardware Check	• Signal fault counter (combustion) > 30.0 [-] • Or • Signal fault counter (measuring window) > 2.0 [-]	• Engine speed > 2,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 -G61-. Refer to ⇒ K3.6.16 nock Sensor 1 G61, Checking”, page 700 . – Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking”, page 702 .
P0327 Knock / Combustion Vibration Sensor 1 Circuit Low Bank 1 or Single Sensor	Knock Sensor Short To Ground Port A Knock Sensor Short To Ground Port B	• Lower threshold < - 0.70 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 -G61-. Refer to ⇒ K3.6.16 nock Sensor 1 G61, Checking”, page 700 . – Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking”, page 702 .
	Knock Sensor Signal Range Check	• Lower threshold < 1.4 – 5.6 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		
P0328 Knock / Combustion Vibration Sensor 1 Circuit High Bank 1 or Single Sensor	Knock Sensor Short To Battery Plus Port A Knock Sensor Short To Battery Plus Port B	• Upper threshold > 1.0 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 -G61-. Refer to ⇒ K3.6.16 nock Sensor 1 G61, Checking”, page 700 . – Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking”, page 702 .
	Knock Sensor Signal Range Check	• Upper threshold > 23.0 – 92.0 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0332 Knock / Combustion Vibration Sensor 2 Circuit Low Bank 2	Knock Sensor Short To Ground Port A Knock Sensor Short To Ground Port B	• Lower threshold < -0.70 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking", page 702 .
	Knock Sensor Signal Range Check	• Lower threshold < 1.4 – 5.6 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		
P0333 Knock / Combustion Vibration Sensor 2 Circuit High Bank 2	Knock Sensor Short To Battery Plus Port A Knock Sensor Short To Battery Plus Port B	• Upper threshold > 1.0 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking", page 702 .
	Knock Sensor Signal Range Check	• Upper threshold > 23.0 – 92.0 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		
P0341 Camshaft Position Sensor "A" Circuit Range/ Performance Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	• Signal pattern incorrect		• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0342 Camshaft Position Sensor "A" Circuit Low Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	• Signal voltage permanently low • Crankshaft signal 8.0 [-]		• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 .
P0343 Camshaft Position Sensor "A" Circuit High Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	• Signal voltage permanently high • Crankshaft signal 8.0 [-]		• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 .
P0351 Ignition Coil "A" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0352 Ignition Coil "B" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0353 Ignition Coil "C" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0354 Ignition Coil "D" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0355 Ignition Coil "E" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0410 AIR System "A"	Air System Check After SAI	• Deviation SAI pressure > 50.0 hPa	• Mass airflow 7.0 – 120.0 kg/h • Delta engine load -10.0 – 10.0%/rev • ECT 5 – 108° C • IAT 5 – 100° C • Altitude < 2,700.0 m • SAI pressure sensor ready	• 6.0 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 . – Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .
P0413 AIR System Switching Valve "A" Circuit Open	Air Valve Open Circuit	• Signal voltage 9.25 – 11.25 V	• Air valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve -N112-. Refer to ⇒ S3.6.26 econdary Air Injection Solenoid Valve N112, Checking", page 723 .
P0414 AIR System Switching Valve "A" Circuit Shorted	Air Valve Short To Ground	• Signal voltage < 6.0 V	• Air valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve -N112-. Refer to ⇒ S3.6.26 econdary Air Injection Solenoid Valve N112,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Air Valve Short To Battery Plus	• Signal current 2.20 – 4.20 A	• Air valve commanded on • Engine speed > 80 RPM			Checking", page 723 .
P0418 AIR System Control "A" Circuit	Air Pump Relay Open Circuit	• Signal voltage 4.50 – 5.50 V	• Pump relay commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0420 Catalyst System Efficiency Below Threshold Bank 1	Catalyst System Measure Of OSC Compared To OSC Of Borderline Catalyst	• Measured OSC / OSC of borderline catalyst measured OSC (HC and NOx-correlated) < 1.0 [-]	• Time after engine start > 343.0 s • Or • Time after dew point > 343.0 s • Delta exhaust mass flow < 25.0 kg/h • Exhaust gas mass flow, lower range 25.0 – 130.0 kg/h (CBUA) • Exhaust gas mass flow, lower range 25.0 – 120.0 kg/h (CBTA) • Exhaust gas mass flow, upper range n.a. • Modeled exhaust gas temp. dynamic < 50 K • Modeled exhaust gas temp. in catalyst system, lower range 500 – 860° C (CBUA) • Modeled exhaust gas temp. in catalyst system, lower range 560 – 860° C (CBTA) • Modeled exhaust gas temp. in catalyst system, upper range n.a. • Minimum modeled exhaust gas temp. in catalyst system > 400° C • For time > 120.0 s • Filtered minimum modeled exhaust gas temp. in catalyst system > 450° C • Engine load 12.8 – 65.3% (CBUA) • Engine load 12.8 – 60.0% (CBTA)	• 40.0 s (CBUA) • 30.0 s (CBTA) • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Three Way Catalytic Converter (TWC). Refer to ⇒ T3.6.27 hree Way Catalytic Converter (TWC), Checking", page 725 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
			• Evap purge loading not high • Engine speed 1,200 – 3,320 RPM • Range between lambda set value and lambda value < 0.02 [-] • Out of lambda range < 2.0 s • Lambda control closed loop • Lambda control not at min or max limit • Number of checks 3.0 [-] • O2S front ready • O2S rear ready • SAS not active • No misfire • O2S front response monitoring in current driving cycle ready			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0441 EVAP System Incorrect Purge Flow	EVAP System Functional Check	• Deviation lambda control < 9.0% • And • Deviation idle control < 40.0%	• Time after engine start n.a. • Engine speed idle • Engine speed deviation < 100 RPM • ECT > 60° C • Or • Substitute ECT > 80° C • IAT > 5° C • Altitude < 2,700.0 m • Lambda control closed loop	• 20.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks", page 7 . – Check the EVAP Canister Purge Regulator Valve 1 - N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump - V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump - V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0442 EVAP System Leak Detected (Small Leak)	EVAP System Small Leak Pressure Check	• Time for pressure drop < 1.9 s	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Air temperature drop after engine start < 5 K • Intake manifold vacuum > -2,560.0 hPa • Altitude < 2,700.0 m • Vehicle speed >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Restart temperature difference > 52 K • Evap purge valve closed • LDP active • Deep down hill driving • Delta ambient pressure < 7.03 hPa • Or • Engine load not < 19.5 – 45.0% • And • Delta vehicle speed not > -1 km/h	• 180.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks", page 7 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144 Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0444 EVAP System Purge Control Valve "A" Circuit Open	EVAP Purge Valve Open Circuit	• Signal voltage > 4.40 – 5.40 V	• EVAP purge valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0455 EVAP System Leak Detected - Large Leak	EVAP System Large Leak Pressure Check	• Time for pressure drop < 0.95 s • .	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Air temperature drop after engine start < 8 K • Intake manifold vacuum > -2,560.0 hPa • Altitude < 2,700.0 m • Vehicle speed >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Restart temperature difference > 52 K • Evap purge valve closed • LDP active • Deep down hill driving • Delta ambient pressure < 7.03 hPa • Or • Engine load not < 19.5 – 45.0% • And • Delta vehicle speed not >= -1 km/h	• 180.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks", page 7 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0456 EVAP System Leak Detected (Very Small Leak)	EVAP System Very Small Leak Pressure Check	• Time for pressure drop < 5.8 s	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Air temperature drop after engine start < 3 K • Intake manifold vacuum > -2,560.0 hPa • Altitude < 2,700.0 m • Vehicle speed 0 – 140 od. >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Restart temperature difference > 52 K • Evap purge valve closed • LDP active • Hill driving • Delta ambient pressure -8.0 – 2.0 hPa • Or • Engine load not < 19.5 – 45.0% • And • Delta vehicle speed not >= -1 km/h • Additional: • Vehicle acceleration < 3.80 m/s2 • Delta engine load < 767.98%/seg	• 180.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks", page 7 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0458 EVAP System Purge Control Valve "A" Circuit Low	EVAP Purge Valve Short To Ground	• Signal voltage < 2.15 – 3.25 V	• EVAP purge valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 .
P0459 EVAP System Purge Control Valve "A" Circuit High	EVAP Purge Valve Short To Battery Plus	• Signal current > 2.2 A	• EVAP purge valve commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0491 AIR System Insufficient Flow Bank 1	Air System Flow Check During Catalyst Heating	• SAI pressure measured with SAI pressure sensor vs. modeled < 50.0 – 72.0% • Or • Absolute deviation of raw pressure signal from filtered signal: mean value < 1.5 – 9.0 hPa	• Mass air flow 7.0 – 120.0 kg/h • Delta engine load -10.0 – 10.0%/rev • ECT 5 – 108° C • IAT 5 – 100° C • Altitude < 2,700.0 m • SAI pressure sensor ready	• 45.0 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 . – Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0496 EVAP System High Purge Flow	Evaporative Emission System Incorrect Purge Flow - Stuck open	• Actual EVAP pump current vs. difference from last reading > 1.0 [-]	• Minimum ignition angle efficiency 20.0% • Engine speed > 20 RPM • Engine speed Deviation < 100 RPM • Time after engine start > 600.0 s • ECT > 60° C • And • ECT at start < 60° C • AAT > 4 [-] • And • < 35° C • Altitude < 2,700.0 m • O2S front ready • EVAP purge valve commanded off	• 5.0 s	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .
P0501 Vehicle Speed Sensor "A" Circuit Range/Performance	Vehicle Speed Plausibility Check	• Vehicle speed < 6 km/h	• Engine speed > 2,800 RPM • Engine torque > 120.0 Nm • Vehicle speed sensor no fault	• 10.5 s • Multiple	• 2 DCY	– Check the vehicle speed signal. Refer to ⇒ V3.6.29 ehicle Speed Signal, Checking", page 729 . – Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0506 Idle Control System RPM - Lower Than Expected	Idle Controller Out Of Range Low	• Engine speed deviation < -100 RPM • And • RPM controller torque value >= calculated max value.	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT > -48 °C • IAT > -48 °C • Vehicle speed ready • Evap purge valve closed • External torque request not demanded • For manual transmission: • Engine load < 34.5%	• 7.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0507 Idle Control System RPM - Higher Than Expected	Idle Controller Out Of Range High	• Engine speed deviation > 100 RPM • And • RPM controller torque value <= calculated min. value • Or • RPM controller P-portion and I-portion < -20.0 Nm	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT > -48 °C • IAT > -48 °C • Vehicle speed ready • Evap purge valve closed • External torque request not demanded	• 7.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P050A Cold Start Idle Control System Performance	Cold Start Monitoring Idle Controller Out of Range Low	• Engine speed deviation < -100 RPM • And • RPM controller torque value >= calculated max. value	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT @ start < 143° C • IAT > -48° C • EVAP purge valve closed • External torque request not demanded • Catalyst heating active • For manual transmission: • Engine load < 34.5%	• 5.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
	Cold Start Monitoring Idle Controller Out of Range High	• Engine speed deviation > 100 RPM • RPM controller torque value <= calculated min. value • RPM controller P-portion and I-portion < -20.0 Nm	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT @ start < 143° C • IAT > -48° C • EVAP purge valve closed • External torque request not demanded • Catalyst heating active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P052A Cold Start "A" Camshaft Position Timing Over-Advanced Bank 1	Cold Start Monitoring VVT Actuator Intake Target Error	• Difference between target position vs. actual position > 10° CRK	• Time after engine start >= 10.0 s • Engine speed >= 400 RPM • Modeled oil temperature >= -48° C • Catalyst heating active	• 5.0 s • Once / DCY	• 2 DCY	– Check engine oil for incorrect viscosity or in need of servicing (dirty oil). Oil that is not clear in color may be causing the sensor to operate incorrectly. The engine oil must be clean and of the correct viscosity in order for the sensor to operate properly. Check the vehicle paperwork to determine what oil viscosity has been used and when the last oil change was performed. Change the engine oil if necessary. – Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 .
P0606 ECM/PCM Processor	Oxygen Sensors Heater Front Out Of Range	• Difference between measured calibration resistance in ECM and set value > 45.0 Ω	• Time after engine start > 40.0 s • Engine speed idle	• 40.0 s • Multiple	• 2 DCY	– Replace the Engine/Motor Control Module -J623-. Refer to appropriate repair manual.
	Altitude Sensor Plausibility Check	• Signal gradient > 50.0 hPa		• 20.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Signal gradient < -50.0 hPa				
	Altitude Sensor Short To Ground	• Signal voltage < 0.20 V		• 0.2 s • Multiple		
	Altitude Sensor Short To Battery / Open Circuit	• Signal voltage > 4.88 V				
	ECM: WDA Function Monitoring: WDA	• General cause failure		• 0.5 s • Continuous		
		• Internal check failure				
		• Overvoltage detection failure				
	ECM: EEPROM Check	• Check failed				
	ECM: Self Check For Sensor IC internal Hardware Check (Electrical Adjustment Communication, Voltage Supply)	• Check				
	ECM: 5V Supply Voltage Internal Hardware Check	• Under-/ overvoltage detection				
	ECM: A/D Converter Power-Up Calibration	• Check failed	• Initialization phase active			
	ECM: A/D Converter Adc-Cannel Conversion		• Initialization phase active • Power-up calibration executed			
	ECM: EGAS Module Function Monitoring: A/D Converter	• Comparison reference voltage with sensor voltage incorrect				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Test voltage check failed				
		• Internal check failed				
	ECM: EGAS Module Function Monitoring: Torque	• Comparison with allowed engine torque incorrect	• Internal engine speed > 600 RPM			
	ECM: EGAS Module Function Monitoring: Engine Speed Deviation	• Difference between calculated and internal engine speed > 320 RPM	• Internal engine speed > 520 RPM			
	ECM: EGAS Module Function Monitoring: Coding	• Internal check failed				
	ECM: EGAS Module Function Monitoring: Ignition Timing					
	ECM: EGAS Module Function Monitoring: Intern	• System reaction incorrect				
	ECM: EGAS Module Function Monitoring: Injection Rate Limitation					
	ECM: EGAS Module Function Monitoring: Accelerator Position	• Internal check failed				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	ECM: EGAS Module Monitoring Module	• Function controller check failed • And • Monitoring module check no failure	• SPI - interface no failure			
	CAN: Internal Fault CAN Controller RAM Check	• RAM error memory checksum error	• Initialization phase • Time after ignition on 500.0 ms	• 0.0 ms • Once / DCY		
P0627 Fuel Pump "A" Control Circuit/ Open	Fuel Pump Relay Open Circuit	• Signal voltage 4.50 – 5.50 V	• Pump relay commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 .
	Fuel Pump Relay Short To Ground	• Signal voltage < 3.0 V				
P0629 Fuel Pump "A" Control Circuit High	Fuel Pump Relay Short To Battery Plus	• Signal current 0.60 – 1.20 A	• Pump relay commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0638 Throttle Actuator Control Range/Performance Bank 1	Throttle Actuator Basic Settings Rationality Check Close Movement	• Time to close to reference point > 0.6 s • And • Reference point 2.88%	• Engine speed 0 RPM • Vehicle speed 0 km/h • ECT > -20° C • IAT > -20° C • Case 1: • Ignition on • Case 2: • Engine shut-off-time 3.0 s • Number of checks 2.0 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
	Throttle Actuator Basic Settings Signal Range Check @ Mechanical Stop Low	• TPS 1 signal voltage not (0.40 – 0.80) V • Or • TPS 2 signal voltage not (4.20 – 4.60) V • Or • TPS1 + TPS2 not (4.82 – 5.18) V	• Engine speed 0 RPM • Vehicle speed 0 km/h • Case 1: • Ignition on • ECT -20 – 115° C • IAT -20 – 143° C • Case 2: • Engine shut-off-time 3.0 s • ECT 5 – 115° C • IAT 5 – 143° C	• 0.3 s • Multiple		
P0641 Sensor Reference Voltage "A" Circuit/Open	ECM: Sensor Reference Circuit A Signal Range Check	• Signal voltage deviation > +/- 0.3 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/Motor Control Module -J623-. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0651 Sensor Reference Voltage "B" Circuit/ Open	ECM: Sensor Reference Circuit B Signal Range Check	• Signal voltage deviation > +/- 0.3 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/ Motor Control Module -J623-. Refer to appropriate repair manual.
P0697 Sensor Reference Voltage "C" Circuit/ Open	ECM: Sensor Reference Circuit C Signal Range Check	• Signal voltage deviation > +/- 0.3 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/ Motor Control Module -J623-. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P117A Bank 1, Oxygen Sensor Correction Center Sensor Control Limit Reached	Fuel System Out Of Range	• I - portion of 3rd lambda control loop > 0.03 [-]	• Engine speed 1,400 – 3,600 RPM • Modeled exhaust gas temp 350 – 1,000° C • Engine load 20.3 – 54.8% • Lambda control closed loop • 2nd lambda control closed loop • 3rd lambda control closed loop • O2S rear ready • Electrical check ready • O2S heater rear ready no fault	• 1,800.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)”, page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking”, page 713 .
P150A Engine Off Timer Performance	Engine-Off-Time Comparison Of Engine Off Time From Instrument Cluster Control Unit With Engine After Run Time	• Difference between engine-off-time and ECM after-run time < -12.0 s	• Key on after ECM after run time active • CAN active	• 6.0 s • Once / DCY	• 2 DCY	– If ignition off B+ is lost to ECM, this code will set. Check power and ground inputs to ECM first. Refer to Wiring Diagrams for pin locations. If all power/ grounds to ECM are

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Difference between engine-off-time and ECM after-run time > 12.0 s	• Key on during ECM after run time active • CAN active			present, replace the Engine/ Motor Control Module -J623-. Refer to appropriate repair manual.
P2088 "A" Camshaft Position Actuator Control Circuit Low Bank 1	VVT Actuator Intake Short To Ground	• Signal voltage < 2.15 – 3.25 V	• Camshaft valve off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking”, page 674 . – Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking”, page 672 .
P2089 "A" Camshaft Position Actuator Control Circuit High Bank 1	VVT Actuator Intake Short To Battery Plus	• Signal current > 2.2 A	• Camshaft valve on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking”, page 674 . – Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking”, page 672 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2096 Post Catalyst Fuel Trim System Too Lean Bank 1	Fuel System Out Of Range	• I-portion of 2nd lambda control loop < -0.040 [-] (CBTA) • I-portion of 2nd lambda control loop < -0.030 [-] (CBUA)	• Modeled exhaust gas temp. 400 – 1,000° C • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • Lambda control not at min or max limit • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front active • O2S heater rear active • Fuel cut off not active • Catalyst heating not active • SAI not active	• 140.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking”, page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)”, page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2097 Post Catalyst Fuel Trim System Too Rich Bank 1	Fuel System Out Of Range	• I-portion of 2nd lambda control loop > 0.040 [-] (CBTA) • I-portion of 2nd lambda control loop > 0.030 [-] (CBUA)	• Modeled exhaust gas temp. 400 – 1,000° C • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • Lambda control not at min or max limit • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front active • O2S heater rear active • Fuel cut off not active • Catalyst heating not active • SAI not active	• 140.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking”, page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)”, page 680 .
P2101 Throttle Actuator "A" Control Motor Circuit Range/Performance	Throttle Actuator Rationality Check	• Deviation throttle value angles vs calculated value > 4.0 – 50.0%		• 0.5 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking”, page 726 .
	Throttle Actuator Signal Range Check	• Duty cycle > 80.0% • And • ECM power stage no failure		• 5.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2106 Throttle Actuator Control System - Forced Limited Power	Throttle Actuator Open Circuit	• Internal check	• Duty cycle > 80.0% • Or • Deviation throttle value angle vs. calculated value > 4.0 – 50.0%	• 12.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
	Throttle Actuator Functional Check	• Internal check failed				
	Throttle Actuator Temperature / Current Monitoring					
	Throttle Actuator Short To Battery Plus / Short To Ground	• Internal check				
P2122 Throttle/ Pedal Position Sensor/ Switch "D" Circuit Low	Accelerator Position Sensor 1 Out Of Range Low	• Signal voltage < 0.6 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .
P2123 Throttle/ Pedal Position Sensor/ Switch "D" Circuit High	Accelerator Position Sensor 1 Out Of Range High	• Signal voltage > 4.8 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .
P2127 Throttle/ Pedal Position Sensor/ Switch "E" Circuit Low	Accelerator Position Sensor 2 Out Of Range Low	• Signal voltage < 0.3 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2128 Throttle/ Pedal Position Sensor/ Switch "E" Circuit High	Accelerator Position Sensor 2 Out Of Range High	• Signal voltage > 2.4 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .
P2138 Throttle/ Pedal Position Sensor/ Switch "D"/"E" Voltage Correlation	Accelerator Position Sensor 1 And 2 Rationality Check	• Signal voltage sensor 1 vs. 2 > 0.167 – 0.703 V	• Signal voltage sensor 1 > 445.0 mV • Signal voltage sensor 2 > 445.0 mV	• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2177 System Too Lean Off Idle Bank 1	Fuel System Too Lean @ Part Load	• Adaptive value > 28.0%	• Time after engine start n.a. • Engine speed 1,320 – 4,600 RPM • Engine load 25.0 – 46.0% • Mass air flow 45.0 – 300.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Lambda control closed loop • Evap purge valve closed • If low fuel signal then wait until fuel consumption n.a.	• 25.0 s • Multiple	• 2 DCY	– Check the vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2178 System Too Rich Off Idle Bank 1	Fuel System Too Rich @ Part Load	• Adaptive value < -28.0%	• Time after engine start n.a. • Engine speed 1,320 – 4,600 RPM • Engine load 25.0 – 46.0% • Mass air flow 45.0 – 300.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Lambda control closed loop • Evap purge valve closed	• 25.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						Manifold Sensor GX9, Checking", page 698 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2181 Cooling System Performance	Coolant System Performance Cooling System Performance Not In A Expect Range	• Thers_03: • Cooling system temperature to low after a sufficient air mass flow integral 75° C	• Thres_01: • Begin of air mass integration when engine temp. 30° C • Thers_02: • ECT @ start -10 – 60° C • AAT > -10° C • Fuel cut off not active • And • Engine load 14.0 – 95.0% • Air mass_01: • Integrated air mass depending on engine temp. at start and AAT 4.0 – 13.5 kg/h (CBTA) • Integrated air mass depending on engine temp. at start and AAT 4.0 – 13.47 kg/h (CBUA) • Depending on temp. at engine start and min. observed AAT for longer than 120.0 – 180.0 s • Depending on temp. at engine start and min. observed AAT for more than 4.0 – 12.0 kg • At time of fault decision: • Average air mass flow 35.0 – 280.0 kg/h • Average vehicle speed 30 – 120 km/h	• 2.0 s • Once / DCY	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2184 Engine Coolant Temperature Sensor 2 Circuit Low	Fan Control Coolant Temperature Sensor Short To Ground	• ECT outlet > 140° C		• 2.0 s • Continuous	• 2 DCY	– Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .
P2185 Engine Coolant Temperature Sensor 2 Circuit High	Fan Control Coolant Temperature Sensor Short To Battery / Open Circuit	• ECT outlet < -40° C		• 2.0 s • Continuous	• 2 DCY	– Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2187 System Too Lean at Idle Bank 1	Fuel System Too Lean @ Idle	• Adaptive value > 5.02%	• Time after engine start n.a. • Engine speed < 860 RPM • Mass air flow < 35.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Delta part load adaptation ready • Lambda control closed loop • Evap purge valve closed • If low fuel signal then wait until fuel consumption n.a.	• 40.0 s • Multiple	• 2 DCY	– Check the vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking”, page 716 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2188 System Too Rich at Idle Bank 1	Fuel System Too Rich @ Idle	• Adaptive value < -5.02%	• Time after engine start n.a. • Engine speed < 860 RPM • Mass air flow < 35.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Delta part load adaptation ready • Lambda control closed loop • Evap purge valve closed • If low fuel signal then wait until fuel consumption n.a.	• 40.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						Manifold Sensor GX9, Checking", page 698 . – Check the EVAP Canister Purge Regulator Valve 1 - N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2195 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 1	Oxygen Sensors Front Out Of Range	• Delta lambda of 2nd lambda control loop > 0.065 [-] (CBTA) • Delta lambda of 2nd lambda control loop > 0.070 [-] (CBUA)	• Modeled exhaust gas temp 400 – 1,000° C • Delta engine load < 12.0% • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front ready • O2S heater rear ready • Fuel cut off not active • Catalyst heating not active • SAI not active • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V	• 100.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2196 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 1	Oxygen Sensors Front Out Of Range	• Delta lambda of 2nd lambda control loop < -0.065 [-] (CBTA) • Delta lambda of 2nd lambda control loop < -0.070 [-] (CBUA)	• Modeled exhaust gas temp 400 – 1,000° C • Delta engine load < 12.0% • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front ready • O2S heater rear ready • Fuel cut off not active • Catalyst heating not active • SAI not active • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V	• 100.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking, page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2237 O2 Sensor Positive Current Control Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Pump Current (IP)	• O2S signal front < 1.70 V • And • Fuel cutoff > 3.0 s	• O2S ceramic temp > 720° C • Electrical adjustment not active • Heater control closed loop • Evap purge valve ready	• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
		• O2S signal front 1.49 – 1.51 V • And • Delta lambda controller > 0.10 [-]	• O2S ceramic temp > 720° C • Lambda modulation > 0.02 [-] • Lambda control closed loop • Heater control closed loop	• 6.5 s • Multiple		
P2243 O2 Sensor Reference Voltage Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Nernst Voltage (UN)	• O2S signal front > 4.70 V • And • Internal resistance > 950.0 Ω	• Heater control active	• 25.5 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
		• O2S signal front < 0.20 V • And • Internal resistance > 950.0 Ω				
P2251 O2 Sensor Negative Current Control Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Virtual Mass (VM)	• O2S signal front 1.47 – 1.53 V • And • Internal resistance > 950.0 Ω	• Modeled exhaust gas temp < 750 Ω • No fuel cutoff > 2.0 s • Heater control active	• 30.5 s	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2257 AIR System Control "A" Circuit Low	Air Pump Relay Short To Ground	• Signal voltage < 3.0 V	• Pump relay commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .
P2258 AIR System Control "A" Circuit High	Air Pump Relay Short To Battery Plus	• Signal current 0.60 – 1.20 A	• Pump relay commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .
P2270 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF Stuck Lean (If Sensor Stuck Lean: 30.0% Enrichment) (CBTA)	• O2S signal rear not oscillating at reference < 600.0 mV	• Mass air flow 22.0 – 120.0 kg/h (CBTA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 30.0 s (CBTA) • 2nd lambda control closed loop	• 210.0 s (CBTA) • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear 2 - Point - LSF Stuck Lean (If Sensor Stuck Lean: 20.0 - 30.0% Closed Loop Enrichment) (CBUA)		• Mass air flow 30.0 – 120.0 kg/h (CBUA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 10.0 s (CBUA) • 2nd lambda control closed loop	• 80.0 s (CBUA) • Multiple		– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)”, page 680 .
P2271 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF Stuck Rich (If Sensor Stuck Rich: 7.0% Enleanment) If Enleanment Is Not Successful: Waiting For Next Fuel Cut Off (CBTA)	(CBTA) • O2S signal rear not oscillating at reference > 600.0 mV	(CBTA) • Mass air flow 22.0 – 120.0 kg/h (CBTA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 30.0 s (CBTA) • Fuel cut off > 3.0 s • 2nd lambda control closed loop	• 210.0 s (CBTA) • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking”, page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear (Binary Check Of Response Time At Fuel Cut Off (CBTA)	(CBTA) • Response time at fuel cut off > 6.0 s • And • Measurement range from fuel cut off to voltage threshold <= 191.0 mV • And • Number of checks (initial phase) >= 1.0 [-] • Or • Measurement range from fuel cut off to O2 mass flow threshold >= 7,000.0 mg • And • Number of checks (initial phase) >= 1.0 [-]	(CBTA) • Rich voltage (enable) >= 548.0V • Lean voltage <= 191.0V • O2S rear ready • Rear O2-sensor signal oscillating • Monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2-Sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131,070.0 Ω	• 6.0 s (CBTA) • Multiple		
	Oxygen Sensors Rear 2 - Point - LSF Stuck Rich (If Sensor Stuck Rich: 7.0% - 15.0% Closed Loop Enleanment) If Enleanment Is Not Successful: Waiting For Next Fuel Cut Off (CBUA)	(CBUA) • O2S signal rear not oscillating at reference > 600.0 mV	(CBUA) • Mass air flow 30.0 – 120.0 kg/h (CBUA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 10.0 s (CBUA) • Fuel cut off > 3.0 s • 2nd lambda control closed loop	• 80.0 s (CBUA) • Multiple		Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear (Binary LSF) Check Of Response Time At Fuel Cut Off (CBUA)	(CBUA) • Response time at fuel cut off > 6.0 s • And • Measurement range from fuel cut off to voltage threshold <= 191.0 mV • And • Number of checks (initial phase) >= 1.0 [-] • Or • Measurement range from fuel cut off to O2 mass flow threshold >= 4,000.0 mg • And • Number of checks (initial phase) >= 1.0 [-]	(CBUA) • Rich voltage (enable) >= 548.0V • Lean voltage n.a. • O2S rear ready • Rear O2-sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131,070.0 Ω	• 4.5 s (CBUA) • Multiple		
P2274 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF Stuck Lean (If Sensor Stuck Lean: 30.0% Enrichment)	• O2S signal rear not oscillating at reference < 600.0 mV	• Mass air flow 22.0 – 120.0 kg/h • Modeled exhaust gas temp. > 350° C • O2S rear readiness > 30.0 s • 2nd lambda control closed loop	• 210.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)”, page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2275 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF Stuck Rich (If Sensor Stuck Rich: 7.0% Enleanment) If Enleanment Is Not Successful: Waiting For Next Fuel Cut Off	• O2S signal rear not oscillating at reference > 600.0 mV	• Mass air flow 22.0 – 120.0 kg/h • Modeled exhaust gas temp. > 350° C • O2S rear readiness > 30.0 s • Fuel cut off active • 2nd lambda control closed loop	• 210.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .
	Oxygen Sensors Rear (Binary LSF) Check Of Response Time At Fuel Cut Off	• Response time at fuel cut off > 6.0 s • And • Measurement range from fuel cut off to voltage threshold <= 191.0 mV • And • Number of checks (initial phase) >= 1.0 [-] • Or • Measurement range from fuel cut off to O2 mass flow threshold >= 7,000.0 mg • And • Number of checks (initial phase) >= 1.0 [-]	• Rich voltage (enable) >= 548.0V • Lean voltage n.a. • O2S rear ready • Rear O2 - sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131,070.0 Ω	• 4.5 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2279 MAP/ MAF - Throttle Position Correlation	Leak to Intake Manifold Adaptation Value Monitoring	• Offset value throttle mass flow > 13.0 kg/h	• Desired mass flow 0.0 – 25.0 kg/h • EVAP purge valve closed • EGR off	• 10.0 s • Multiple	• 2 DCY	• Check for air leaks near the throttle body, oil fill cap not tight or oil dipstick not seated in tube. Also check for any engine gaskets that can cause additional air to enter the crankcase can set this fault as the PCV system is not metered. If a vacuum leak or crankcase seal is the cause, the idle may be rough or unstable. – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ "3.6.15 Intake Manifold Sensor GX9, Checking", page 698 . – Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ "3.6.28 Throttle Valve Control Module GX3 / J338, Checking", page 726 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ "3.6.10 EVAP Canister Purge Regu-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						lator Valve 1 N80, Checking", page 688 .
P2300 Ignition Coil "A" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2301 Ignition Coil "A" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2303 Ignition Coil "B" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2304 Ignition Coil "B" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2306 Ignition Coil "C" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2307 Ignition Coil "C" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2309 Ignition Coil "D" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2310 Ignition Coil "D" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2312 Ignition Coil "E" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2313 Ignition Coil "E" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2400 EVAP System Leak Detection Pump Control Circuit/ Open	LDP Open Circuit	• Signal voltage > 4.40 – 5.60 V	• LDP commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2401 EVAP System Leak Detection Pump Control Circuit Low	LDP Short To Ground	• Signal voltage < 2.15 – 3.25 V	• LDP commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .
P2402 EVAP System Leak Detection Pump Control Circuit High	LDP Short To Battery Plus	• Signal current > 3.0 A	• LDP commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2403 EVAP System Leak Detection Pump Sense Circuit/ Open	Reed Sensor Rationality Check Unable To Close	• Low signal voltage > 0.5 s	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Altitude < 2,700.0 m • Integrated purge flow > 29.90 g • Restart temperature difference > 52 K • Vehicle speed >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Evap purge valve ready • LDP commanded off	• 0.5 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)”, page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)”, page 706 .
P2404 EVAP System Leak Detection Pump Sense Circuit Range/ Performance	Reed Sensor Rationality Check Unable To Open	• High signal voltage > 12.0 s • And • Number of checks 30.0 [-]	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Altitude < 2,700.0 m • Intake manifold vacuum > -2,560.0 hPa • Restart temperature difference > 52 K • Vehicle speed >= 0 km/h	• 12.0 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)”, page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)”, page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Cumulative time of high signal voltage during pumping > 10.0 s	• Vehicle speed ones > 30 km/h • Selected gear any drive • Evap purge valve closed, ready • LDP commanded on	• 120.0 s • Once / DCY		
P240A EVAP System Leak Detection Pump Heater Control Circuit/ Open	EVAP Leak Detection Pump Open Circuit	• Signal voltage > 4.7 – 5.4 V	• Evap pump heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 , as applicable.
P240B EVAP System Leak Detection Pump Heater Control Circuit Low	EVAP Leak Detection Pump Short To Ground	• Signal voltage < 2.74 – 3.26 V	• Evap pump heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 , as applicable.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P240C EVAP System Leak Detection Pump Heater Control Circuit High	EVAP Leak Detection Pump Short To Battery Plus	• Signal current > 2.2 – 4.0 A	• Evap pump heater commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 , as applicable.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2407 EVAP System Leak Detection Pump Sense Circuit Intermittent/ Erratic	EVAP Leak Detection Pump Signal Check During Engine Off	• Fluctuation of evap pump current during reference measurement > 1 mA • Or • Drop of evap pump current during pump phase > 6 mA • For time >= 3.0 s	• Engine temperature @ engine start >= 4° C • Difference between ECT and IAT @ engine start <= 15 K • Ambient air temperature < 35; > 4° C • Altitude <= 2700 m • Time since engine start in preceding dcy >= 600.0 s • Change in battery voltage during monitoring < 1.0 V • Engine off time >= 5.0 s • Vehicle speed 0 km/h • Evap purge adaptation < 5.0 [-] • Deviation of filtered evap pump current during reference measurement within range <= 1 mA • Change in relative evap pump current during monitoring n.a. • Within time n.a. • (During ECM keep alive-time after ignition off, max. time) < 900.0 s • Airbag not activated • (After MIL illumination because of any EVAP leakage the monitor is only activated every) 1 dcys	• 800.0 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 , as applicable.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2414 O2 Sensor Exhaust Sample Error Bank 1 Sensor 1	Oxygen Sensors Front Signal Range Check (Check For Sensor At Ambient Air)	• Threshold 1: • Signal voltage 3.10 – 4.77 V • Threshold 2: • Signal voltage 2.50 – 3.06 V • Depending on gain factor that actual is used for sensor	• Lambda value < 1.6 [-] • O2S ceramic temp. > 715° C • Fuel cut off not active • Heater control closed loop • SAI not active • If low fuel signal then wait > 0.0 s	• 15.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
P2431 AIR System Air Flow/ Pressure Sensor Circuit Range/ Performance Bank 1	Air System Pressure Sensor Rationality Check	• Difference between SAI pressure and ambient pressure not (-60.0 – 60.0_ hPa	• SAI done	• 0.5 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 .
P2432 AIR System Air Flow/ Pressure Sensor Circuit Low Bank 1	Air System Pressure Sensor Signal Range Check	• Signal voltage < 0.5 V		• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 .
P2433 AIR System Air Flow/ Pressure Sensor Circuit High Bank 1	Air System Pressure Sensor Signal Range Check	• Signal voltage > 4.5 V		• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2440 AIR System Switching Valve Stuck Open Bank 1	Air System Check After SAI	• SAI pressure measured with SAI pressure sensor vs. modeled while SAI valve closed < 65.0%	• ECT 5 – 108° C • IAT 5 – 100° C • Altitude < 2,700.0 m • SAI pressure sensor ready	• 45.0 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve -N112-. Refer to ⇒ S3.6.26 econdary Air Injection Solenoid Valve N112, Checking", page 723 . – Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2450 EVAP System Switching Valve Performance/ Stuck Open	EVAP Leak Detection Pump Rationality Check During Engine Off	• Evap pump current difference between reference measurement to idle <= 3 mA	• Engine temperature @ engine start >= 4° C • Difference between ECT and IAT @ engine start <= 15 K • Ambient air temperature < 35; > 4° C • Altitude <= 2,700 m • Time since engine start in preceding dcy >= 600.0 s • Change in battery voltage during monitoring < 1.0 V • Engine off time >= 5.0 s • Vehicle speed 0 km/h • Evap purge adaptation < 5.0 [-] • No sudden change in evap pump current (filling event) < 2; > -1 mA • Deviation of filtered evap pump current during reference measurement within range <= 1.0 mA • Change in relative evap pump current during monitoring n.a. • Within time n.a. • (During ECM keep alive-time after ignition off, max. time) < 900.0 s • Airbag not activated • (After MIL illumination because of any EVAP leakage the mon-	• 13.5 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 , as applicable.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
			itor is only activated every) 1 dcys			
P2626 O2 Sensor Pumping Current Trim Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Adjustment Voltage (IA)	• O2S signal front > 4.77 V	• Modeled exhaust temp. < 750° C • O2S ceramic temp. > 720° C • Fuel cut off active • Heater control closed loop • If low fuel signal then wait > 0.0 s	• 2.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
P3081 Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	Engine Coolant Temperature Sensor Rationality Measured Engine Coolant Temp. Below Reference Model	• Range_01: • Measured engine coolant temp. not within in a range of the reference model > 11 K	• Modmax_01: • Maximum reference temperature 60° C	• 4.0 s • Multiple	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 .
U0001 High Speed CAN Communication Bus	CAN: CAN-Bus Reading Back Sent Message (Powertrain)	• CAN message no feedback	• Time after ignition on 500.0 ms	• 250.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .
U0002 High Speed CAN Communication Bus Performance	CAN: CAN-Bus CAN Communication Check (Powertrain)	• Global time out receiving no message	• Time after ignition on 500.0 ms	• 450.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
U0101 Lost Communication with TCM	CAN: TCM CAN Communication With TCM	• Received CAN message no message	• Time after ignition on 500.0 ms	• 500.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance between the Transmission Control Module to the Engine/ Motor Control Module -J623-. Refer to ⇒ C3.6.5 AN-Bus Terminal Resistance, Powertrain, Checking", page 678 .
U0121 Lost Communication With Anti-Lock Brake System (ABS) Control Module "A"	CAN: Brake Unit CAN Communication With Brake Unit	• Received CAN message no message	• Time after ignition on 500.0 ms	• 440.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .
U0146 Lost Communication With Gateway "A"	CAN: Gateway CAN Communication With Gateway	• Received CAN message no message	• Time after ignition on 500.0 ms	• 1,000.0 ms • Continuous	• 2 DCY	Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
U0155 Lost Communication With Instrument Panel Cluster (IPC) Control Module	CAN: Instrument Cluster CAN Communication With Instrument Cluster Module	• Received CAN message no message	• Time after ignition on 500.0 ms	• 500.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .
U0302 Software Incompatibility With Transmission Control Module	CAN: TCM CAN Communication With TCM	• Received AT vehicle data TCM signal	• Time after ignition on 500.0 ms	• 100.0 ms • Continuous	• 2 DCY	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Transmission Control Module. Refer to appropriate repair manual.
U0402 Invalid Data Received From TCM	CAN: TCM CAN Communication With TCM	• Received data implausible message	• Time after ignition on 500.0 ms	• 60.0 ms • Continuous	• 2 DCY	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Transmission Control Module. Refer to appropriate repair manual.
U0415 Invalid Data Received From Anti-Lock Brake System (ABS) Control	CAN: Vehicle Speed Sensor CAN Communication With Vehicle Speed Sensor	• Speed sensor signal: initialization error 327.08 km/h • Speed sensor signal: low voltage error 327.25 km/h		• 1,980.0 ms	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 . – Check the vehicle

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
Module "A"		• Speed sensor signal: sensor error 327.42 km/h		• 480.0 ms • Continuous		speed signal. Refer to ⇒ V3.6.29 ehicle Speed Signal, Checking", page 729 .
		• Vehicle speed >= 325 km/h		• 2,100.0 ms • Continuous		
		• Speed sensor signal: out of range 326.39 km/h		• 480.0 ms • Continuous		
	CAN: Brake Unit CAN Communication With Brake Unit	• Received data implausible message	• Time after ignition on 500.0 ms	• 60.0 ms • Continuous		
U0422 Invalid Data Received From Body Control Module	CAN: Ambient Air Temperature Sensor Communication With Instrument Cluster Module	• Ambient temperature value (initialization) 0.0 h [-]	• Key on • Status ambient temperature from instrument cluster no fault • Electrical check ambient temperature sensor no fault	• 3.0 s • Multiple	• 2 DCY	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Body Control Module. Refer to appropriate repair manual.
U0423 Invalid Data Received From Instrument Panel Cluster Control Module	CAN: Instrument Cluster CAN Communication With Instrument Cluster Module	• Received CAN message implausible message	• Time after ignition on 500.0 ms	• 600.0 ms • Continuous	• 2 DCY	– Check for correct software version and VIN or update software for the IPC Module if available. If OK, replace the Instrument Cluster Control Module -J285-. Refer to appropriate repair manual.
	CAN: Ambient Air Temperature Sensor Communication With Instrument Cluster Module (CBTA)	• Ambient temperature value (initialization) 0.0 h [-]	• Key on • Status ambient temperature from instrument cluster no fault • Electrical check ambient temperature sensor no fault	• 3.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
U0447 Invalid Data Received From Gateway "A"	CAN: Gateway CAN Communication With Gateway	• Received data implausible message	• Time after ignition on 500.0 ms	• 300.0 ms • Continuous	• 2 DCY	Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P000A "A" Camshaft Position Slow Response Bank 1	VVT Actuator Intake Slow Response	• Difference between target position vs. actual position > 8 – 12° CRK (CBTA) • Difference between target position vs. actual position > 8° CRK (CBUA) • And • Adjustment angle > 3° CRK	• Time after engine start > 1.5 – 3.0 s • Engine speed 600 – 6,320 RPM • Oil temperature -48 – 143° C • Frequency (normal operation) 7.0 times [-] (CBTA) • Frequency (normal operation) 4.0 times [-] (CBUA) • Or (CBTA) • Frequency (CSM) 1.0 times [-] (CBTA)	• 21.0 (CBTA) • 12.0 s (CBUA) • Multiple	• 2 DCY	– Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0010 "A" Camshaft Position Actuator "A" Control Circuit/ Open Bank 1	VVT Actuator Intake Open Circuit	• Signal voltage > 4.40 – 5.60 V	• Camshaft valve off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0011 "A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	VVT Actuator Intake Target Error	• Difference between target position vs. actual position > 8 – 12° CRK (CBTA) • Difference between target position vs. actual position > 8° CRK (CBUA) • And • Adjustment angle > 3° CRK	• Time after engine start > 1.5 – 3.0 s • Engine speed 600 – 6,320 RPM • Oil temperature -48 – 143° C • Frequency (normal operation) 7.0 times [-] (CBTA) • Frequency (normal operation) 4.0 times [-] (CBUA) • Or (CBTA) • Frequency (CSM) 1.0 times [-] (CBTA)	• 21.0 (CBTA) • 12.0 s (CBUA) • Multiple	• 2 DCY	– Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0016 Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	Camshaft Position Sensor Inlet Angular Offset Check	• Permissible deviation < -13.5° CRK • Or • Permissible deviation > 13.5° CRK		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking”, page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking”, page 674 . – Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking”, page 672 .
P0030 HO2S Heater Control Circuit Bank 1 Sensor 1	Oxygen Sensors Heater Front Open Circuit	• Heater voltage 2.34 – 3.59 V	• Time after engine start > 5.0 s • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking”, page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0031 HO2S Heater Control Circuit Low Bank 1 Sensor 1	Oxygen Sensors Heater Front Short To Ground	• Heater voltage < 2.34 V	• Time after engine start > 5.0 s • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
P0032 HO2S Heater Control Circuit High Bank 1 Sensor 1	Oxygen Sensors Heater Front Short To Battery Plus	• Heater voltage > 3.59 V	• Time after engine start > 5.0 s • Heater commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0036 HO2S Heater Control Circuit Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Open Circuit	• Heater voltage 4.50 – 5.50 V	• Engine speed > 80 RPM (CBTA) • Time after engine start > 5.0 s (CBUA) • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking”, page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)”, page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0037 HO2S Heater Control Circuit Low Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Ground	• Heater voltage < 3.0 V	• Engine speed > 80 RPM (CBTA) • Time after engine start > 5.0 s (CBUA) • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0038 HO2S Heater Control Circuit High Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Battery Plus	• Heater current 2.70 – 5.50 A	• Engine speed > 80 RPM (CBTA) • Time after engine start > 5.0 s (CBUA) • Heater commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0042 HO2S Heater Control Circuit Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Open Circuit	• Heater voltage 4.50 – 5.50 V	• Engine speed > 80 RPM • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0043 HO2S Heater Control Circuit Low Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Ground	• Heater voltage < 3.0 V	• Engine speed > 80 RPM • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0044 HO2S Heater Control Circuit High Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Battery Plus	• Heater current 2.70 – 5.50 A	• Engine speed > 80 RPM • Heater commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .
P0070 Ambient Air Temperature Sensor Circuit "A"	Ambient Air Temperature Sensor Short To Battery / Open Circuit	• Ambient air temperature < -50° C	• CAN active	• 6.0 s • Multiple	• 2 DCY	– Check the Outside Air Temperature Sensor - G17-. Refer to ⇒ O3.6.21 utside Air Temperature Sensor G17, Checking", page 711 . – Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0071 Ambient Air Temperature Sensor Circuit "A" Range/ Performance	Ambient Air Temperature Sensor Range/ Performance	• Diff. ECT vs. IAT at engine start (depending on engine off time) < 24.75° C • And • Diff. IAT vs. AAT at engine start (depending on engine off time) > 24.75° C • And • Diff. AAT vs. ECT at engine start (depending on engine off time) > 24.75° C	• Engine off time > 6.0 h • Blockheater • ECT >= 143° C • Time after engine start 2.0 s • Or • Diff. ECT vs. ECT outlet <= 20° C • Time after engine start 2.0 s • Solar radiation case 1: • AAT @ start <= 2° C • Minus • AAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s • Solar radiation case 2: • IAT @ start <= 2° C • Minus • IAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s	• 60.0 s • Once / DCY	• 2 DCY	– Check the Outside Air Temperature Sensor -G17-. Refer to ⇒ O3.6.21 utside Air Temperature Sensor G17, Checking", page 711 . – Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0072 Ambient Air Temperature Sensor Circuit "A" Low	Ambient Air Temperature Sensor Short To Ground	• Ambient air temperature > 87° C	• CAN active	• 6.0 s • Multiple	• 2 DCY	– Check the Outside Air Temperature Sensor - G17-. Refer to ⇒ O3.6.21 utside Air Temperature Sensor G17, Checking”, page 711 . – Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking”, page 676 .
P0106 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Range/ Performance	Manifold Pressure Sensor Rationality Check Low	• Difference manifold pressure - lower threshold model < 0.0 hPa • Model range 0.0 – 800.0 hPa	• Time after engine start n.a.	• 450.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking”, page 726 . – Check the Intake Manifold Sensor - GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking”, page 698 .
	Manifold Pressure Sensor Rationality Check High	• Difference manifold pressure - lower threshold model > 0.0 hPa • Model range 650.0 – 1,080.0 hPa				
	Manifold Pressure Sensor Rationality Check	• Diff. altitude sensor signal vs. manifold pressure signal at engine start > 60.0 hPa	• Time after engine start < 25.0 s • Engine speed < 330 RPM			
	Manifold Pressure Sensor Adaptation Value Monitoring	• Offset value manifold pressure for load calculation in driving condition range 2.0 > 55.0 hPa	• Driving condition range 1 (omsna): • Engine speed < 800 RPM			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Offset value manifold pressure for load calculation in driving condition range 2.0 < -60.0 hPa	• Desired mass flow 5.0 – 25.0 kg/h • Delta adaptation value range 1.0 < 0.10 kg/h • For time 1.0 s • Driving condition range 2 (opsra): • Engine speed > 1,400 RPM • Manifold pressure < 425.0 hPa • Delta adaptation value range 2.0 < 2.97 hPa • For time 8.0 s • Driving condition range 3 (opua): • Desired mass flow > 40.0 kg/h • Manifold pressure > 550.0 hPa • Delta adaptation value range 3.0 < 2.97 hPa • For time 5.0 s • General: • Engine operation in every driving condition >= 2.0 times • Diagnosis evap purge system not active • Engine speed 500 – 6,000 RPM • Manifold pressure > 0.0 hPa • Ratio manifold pressure to ambient pressure < 0.85 [-]			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0107 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit Low	Manifold Pressure Sensor Short To Ground	• Signal voltage < 0.20 V		• 1.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .
P0108 Manifold Absolute Pressure/ Barometric Pressure Sensor Circuit High	Manifold Pressure Sensor Short To Battery / Open Circuit	• Signal voltage > 4.86 V		• 1.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0111 Intake Air Temperature Sensor 1 Circuit Range/ Performance Bank 1	Intake Air Temperature Rationality Check	• Diff. ECT vs. IAT at engine start (depending on engine off time) > 24.75° C • And • Diff. IAT vs. AAT at engine start (depending on engine off time) > 24.75° C • And • Diff. AAT vs. ECT at engine start (depending on engine off time) < 24.75° C	• Engine off time > 6.0 h • Blockheater • ECT >= 143° C • Time after engine start 2.0 s • Or • Diff. ECT vs. ECT outlet <= 20° C • Time after engine start 2.0 s • Solar radiation case 1: • AAT @ start <= 2° C • Minus • AAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s • Solar radiation case 2: • IAT @ start <= 2° C • Minus • IAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s	• 60.0 s • Once / DCY	• 2 DCY	– Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking”, page 698 . – Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking”, page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking”, page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0112 Intake Air Temperature Sensor 1 Circuit Low Bank 1	Intake Air Temperature Sensor Short To Ground	• IAT > 130° C		• 5.0 s • Multiple	• 2 DCY	– Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 . – Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0113 Intake Air Temperature Sensor 1 Circuit High Bank 1	Intake Air Temperature Sensor Short To Battery / Open Circuit	• IAT < -46° C		• 5.0 s • Multiple	• 2 DCY	– Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 . – Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0116 Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	Engine Coolant Temperature Sensor Stuck Low	• Thres_01[f(ECT)]:Temp_01 • No change on signal 1.5 K	• ECT @ start n.a. • ECT 50 – 75° C • Cold start n.a. • Temp_02 • Substitute ECT > -45° C • Driving condition L: • Vehicle speed 0 – 20 km/h • Mass air flow 4.0 – 40.0 kg/h • Time required / > 10.0 s • Frequency 3.0 times • And • Driving condition H: • Vehicle speed 50 – 150 km/h • Mass air flow 32.0 – 352.0 kg/h • Time required / > 40.0 s • Frequency once	• 70.0 s • Once / DCY	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Engine Coolant Temperature Sensor Stuck High		• Temp_01 • ECT @ start n.a. • ECT 105 – 140° C • Cold start n.a. • Temp_02 • Substitute ECT > -45° C • Driving condition L: • Vehicle speed 0 – 20 km/h • Mass air flow 4.0 – 40.0 kg/h • Time required / > 10.0 s • Frequency 3.0 times • And • Driving condition H: • Vehicle speed 50 – 150 km/h • Mass air flow 32.0 – 352.0 kg/h • Time required / > 40.0 s • Frequency once			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Engine Coolant Temperature Sensor Stuck In Range	• Signal in range 75.0 – 105.0° C • And • No change on signal n. a.	• Cold start detected • Stuck high n.a. • Temp_01 • ECT @ start n.a. • Temp_02 • Substitute ECT n.a. • Driving condition L: • Vehicle speed n.a. • Mass air flow n.a. • time required / n.a. • Frequency n.a. • And • Driving condition H: • Vehicle speed n.a. • Mass air flow n.a. • Time required / n.a. • Frequency n.a.	• 2.0 s • Once / DCY		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0117 Engine Coolant Temperature Sensor 1 Circuit Low	Engine Coolant Temperature Sensor Short To Ground	• ECT > 140° C		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0118 Engine Coolant Temperature Sensor 1 Circuit High	Engine Coolant Temperature Sensor Short To Battery / Open Circuit	• ECT < -40° C		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.
P0121 Throttle/ Pedal Position Sensor/ Switch "A" Circuit Range/ Performance	Throttle Position Sensor 1 Rationality Check	• TPS1-TPS2 > 6.30% • And • • Actual TPS1 - calc. value > actual TPS2 - calc. value • Or • TPS1 - calc. value > 9.0%	• Engine speed > 480 RPM	• 0.3 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0122 Throttle/ Pedal Position Sensor/ Switch "A" Circuit Low	Throttle Position Sensor 1 Out Of Range Low	• Signal voltage < 0.20 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0123 Throttle/ Pedal Position Sensor/ Switch "A" Circuit High	Throttle Position Sensor 1 Out Of Range High	• Signal voltage > 4.81 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0130 O2 Sensor Circuit Bank 1 Sensor 1	Oxygen Sensors Front Out Of Range	• O2S ceramic temp. < 640° C	• Modeled exhaust temp > 300° C • Fuel cut off not active	• 15.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0131 O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	Oxygen Sensors Front Signal Range Check	• Short to ground • Virtual mass (VM) < 1.75 V • Or • Nernst voltage (UN) < 1.50 V • Or • Adjustment voltage (IA) < 0.30 V • Or • Adjustment voltage (IP) < 0.30 V		• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking”, page 716 .
P0132 O2 Sensor Circuit High Voltage Bank 1 Sensor 1	Oxygen Sensors Front Signal Range Check	• Short to battery • Virtual mass (VM) > 3.25 V • Or • Nernst voltage (UN) > 4.40 V • Or • Adjustment voltage (IA) > 7.0 V • Or • Adjustment voltage (IP) > 7.0 V		• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking”, page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0133 O2 Sensor Circuit Slow Response Bank 1 Sensor 1	Oxygen Sensors Front Response Rate Monitoring, Area Ratio	• Symmetric fault: • Lower value of both area ratios R2L and L2R < 0.25 [-] (CBTA) • Lower value of both area ratios R2L and L2R < 0.20 [-] (CBUA) • And • Difference of R2L area ratio vs. L2R area ratio -0.40 – 0.40 [-] • Asymmetric fault: • Lower value of both area ratios R2L and L2R < 0.25 [-] (CBTA) • Lower value of both area ratios R2L and L2R < 0.35 [-] (CBUA) • And • Difference of R2L area ratio vs. L2R area ratio not (-0.40 – 0.40) [-] • General: • Lower value of both counters for area ratio R2L and L2R >= 5 times	• O2S front - min. operation temperature is reached > 720° C • O2S front - time since operation readiness > 40.0 s • Engine speed 1,160 – 2,720 RPM • Engine load 13.99 – 45.0% • Gradient of engine load <= 7.99% • Exhaust system lag time calculation 0.15 – 0.33 s • Gradient of exhaust system lag time calculation <= 0.0 s • ECT >= 10° C • Catalyst temperature >= 450° C • Lambda control set-point prior to diagnostic fuel steps A/F-ratio stoichiometric • Relative fuel amount from wall applied compensation and evap purge <= 0.1 [-] • Canister load < 15.0 [-] • Time since last measurement > 3.0 s • 2nd lambda control loop not active • Forced lambda oscillation not active • SAI not active • Tank leakage detection not active	• 67.0 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
			• Diagnosis evap purge system not active • Fuel cut off for any cylinders not active • Open circuit pump current (IP) ready • Only Flex fuel systems without ethanol sensor: • Ethanol concentration adaptation not active			
P0135 O2 Sensor Heater Circuit Bank 1 Sensor 1	Oxygen Sensors Heater Front Out Of Range High	• O2S ceramic temperature < 720° C • And • Heater duty cycle > 100.0%	• Modeled exhaust gas temp. > 550° C • Heater control active	• 70.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
	Oxygen Sensors Heater Front Rationality Check (Sensor Heating Up)	• O2S ceramic temp < 715° C • And • Time after O2S heater on 35.0 s	• ECT at start > -10° C • Engine shutoff time > 120.0 s • During ECM keep alive time (key off) < 500.0 s	• 35.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0136 O2 Sensor Circuit Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Heater Coupling Check)	• Delta voltage one step at heater switching > 2.0 V • And • Number of heater coupling >= 6.0 times [-]	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • For time > 10.0 s • Heater not active • For time > 0.0 s	• 60.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ Ö3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0137 O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Short To Ground, Core Connection Signal Wires)	• Signal voltage < 0.06 V • For time > 3.0 s • And • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) < 0.01 V	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time n.a. (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time n.a. (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • Fuel cut off not active • Catalyst purge not active	• 3.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0138 O2 Sensor Circuit High Voltage Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Out Of Range High (Short To Battery Plus)	• Signal voltage > 1.08 V • For time > 5.0 s	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • Lambda set value > 0.995 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0139 O2 Sensor Circuit Slow Response Bank 1 Sensor 2	Oxygen Sensors Rear (Binary LSF) Check Of Transient Time At Fuel Cut Off	• EWMA filtered transient time at fuel cut off > 0.6 s • O2 voltage between 201.0 – 401.0 mV • Number of checks (initial phase) >= 4.0 [-] • Number of checks (step function) >= 3.0 [-]	• Rich voltage (enable) >= 548.0 mV • Lean voltage n.a. • O2S rear ready • Rear O2 - sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131,070.0 Ω • Or • Trigger for step change: delta transient time > 0.3 s	• 4.5 s • Multiple	• 1 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P013A O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	• EWMA filtered max differential transient time at fuel cutoff >= 0.8 s • And • Number of checks >= 1.0 [-]	• Time of fuel cut-off <= 90.0 s • Time after last fuel cutoff >= 5.0 s • Rear O2S ready • Exhaust temp at sensor deviation between actual and expected lambda signal < 8 after time since fuel cutoff at first cylinder >= 2.0 s • Exhaust mass flow >= 12.0 kg/h • Exhaust mass flow dynamic within range -500.0 – 500.0 kg/h • Sensor voltage at start of measurement > 0.45 V • Target voltage end of measurement <= 0.15 V	• 10.0 s	• 1 DCY	– For CBTA: Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – For CBUA: Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0140 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Signal Line Open Circuit)	• Signal voltage 0.40 – 0.60 V • For time > 3.0 s • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3.0 measurements) >= 2.80 V	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded	• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Ground Line Open Circuit)	• Internal resistance > 40,000.0 Ω • And • Exhaust temperature > 670° C	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • Valid Ri-measurements > 10.0 times [-]	• 50.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0141 O2 Sensor Heater Circuit Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Out Of Range	• Heater resistance 1,200.0 – 32,400.0 Ω (CBTA) • Heater resistance 880.0 – 30,400.0 Ω (CBUA)	• Modeled exhaust gas temp. 200 – 680° C • Engine shut-off-time > 120.0 s • (During ECM keep alive-time after ignition off) < 500.0 s (CBTA) • (During ECM keep alive-time after ignition off) < 1,200.0 s (CBUA) • Number of checks 10.0 [-] • Fuel cut off not active • Heater commanded on	• 6.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0142 O2 Sensor Circuit Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Heater Coupling Check)	• Delta voltage one step at heater switching > 2.0 V • And • Number of heater coupling >= 6.0 times [-]	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • For time > 10.0 s • Heater not active • For time > 0.0 s	• 60.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0143 O2 Sensor Circuit Low Voltage Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Short To Ground, Core Connection Signal Wires)	• Signal voltage < 0.06 V • For time > 3.0 s • And • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3.0 measurements) < 0.01 [V]	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time n.a. • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time n.a. • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • Fuel cut off not active • Catalyst purge not active	• 3.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0144 O2 Sensor Circuit High Voltage Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Out Of Range High (Short To Battery Plus)	• Signal voltage > 1.08 V • For time > 5.0 s	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • Lambda set value > 0,995 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0145 O2 Sensor Circuit Slow Response Bank 1 Sensor 3	Oxygen Sensors Rear (Binary LSF) Check Of Transient Time At Fuel Cut Off	• EWMA filtered transient time at fuel cut off > 1.5 s • In voltage range 201.0 – 401.0 mV • Number of checks (initial phase) >= 4.0 [-] • Number of checks (step function) >= 3.0 [-]	• Rich voltage enable >= 548.0 mV • Lean voltage n.a. • O2S rear ready • Rear O2 - sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 - sensor internal resistance <= 131,070.0 Ω • Or • Trigger for step change: delta transient time > 0.3 s	• 4.5 s • Multiple	• 1 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0146 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Signal Line Open Circuit)	• Signal voltage 0.40 – 0.60 V • For time > 3.0 s • And • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3.0 measurements) >= 2.80 V	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded	• 5.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Ground Line Open Circuit)	• Internal resistance > 40,000.0 Ω • And • Exhaust temperature > 670° C	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • Valid Ri-measurements > 10.0 times [-]	• 50.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0147 O2 Sensor Heater Circuit Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Out Of Range	• Heater resistance 1,200.0 – 32,400.0 Ω	• Modeled exhaust gas temp. 200 – 680° C • Engine shut-off-time > 120.0 s • (During ECM keep alive-time after ignition off) < 500.0 s • Number of checks 10.0 [-] • Fuel cut off not active • Heater commanded on	• 6.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .
P0169 Incorrect Fuel Composition	ECM: EGAS Module Function Monitoring: Injection Time	• Comparison with fuel quantity incorrect	• Internal engine speed > 1,200 RPM	• 0.5 s • Continuous	• 2 DCY	– Check for contaminated/aged fuel or possible high concentration of alcohol in fuel (above 15%). Poor quality fuel will also increase consumption. Replace with fresh fuel if believed to be contaminated. Refer to appropriate repair manual. – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒
	ECM: EGAS Module Function Monitoring: Lambda Mode	• Internal check failed				
	ECM: EGAS Module Function Monitoring: Mixture Control	• Correction factor incorrect				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Fuel quantity incorrect				O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – If fuel quality is adequate, replace the Engine/ Motor Control Module. Refer to appropriate repair manual.
P0201 Cylinder 1 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0202 Cylinder 2 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0203 Cylinder 3 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0204 Cylinder 4 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0205 Cylinder 5 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0221 Throttle/ Pedal Position Sensor/ Switch "B" Circuit Range/ Performance	Throttle Position Sensor 2 Rationality Check	• TPS1 - TPS2 > 6.30% • And • • Actual TPS2 - calc. value > actual TPS1 - calc. value • or • TPS2 - calc. value > 9.0%	• Engine speed > 480 RPM	• 0.3 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0222 Throttle/ Pedal Position Sensor/ Switch "B" Circuit Low	Throttle Position Sensor 2 Out Of Range Low	• Signal voltage < 0.20 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0223 Throttle/ Pedal Position Sensor/ Switch "B" Circuit High	Throttle Position Sensor 2 Out Of Range High	• Signal voltage > 4.81 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0261 Cylinder 1 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0262 Cylinder 1 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0264 Cylinder 2 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0265 Cylinder 2 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0267 Cylinder 3 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0268 Cylinder 3 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0270 Cylinder 4 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0271 Cylinder 4 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0273 Cylinder 5 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0274 Cylinder 5 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0300 Random/ Multiple Cylinder Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	⇒ F3.6.13 uel Injectors, Checking”, page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking”, page 696 .
P0301 Cylinder 1 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system me-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	chanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0302 Cylinder 2 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low com-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	pression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0303 Cylinder 3 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)	• Rough road not detected	• 200 rev • Multiple	• Immediately	cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0304 Cylinder 4 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)	• Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 200 rev • Multiple	• Immediately	visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						Stage, Checking", page 696 .
P0305 Cylinder 5 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0321 Ignition/ Distributor Engine Speed Input Circuit Range/ Performance	RPM Sensor Rationality Check	• Counted teeth vs. reference incorrect • Or • Monitoring reference gap failure		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 .
P0322 Ignition/ Distributor Engine Speed Input Circuit No Signal	RPM Sensor Signal Activity Check	• Camshaft signals > 5.0 [-] • And • Engine speed no signal		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0324 Knock / Combustion Vibration Control System Error	Knock Control Internal Hardware Check	• Signal fault counter (combustion) > 30.0 [-] • Or • Signal fault counter (measuring window) > 2.0 [-]	• Engine speed > 2,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 -G61-. Refer to ⇒ K3.6.16 noc k Sensor 1 G61, Checking", page 700 . – Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 noc k Sensor 2 G66, Checking", page 702 .
P0327 Knock / Combustion Vibration Sensor 1 Circuit Low Bank 1 or Single Sensor	Knock Sensor Short To Ground Port A Knock Sensor Short To Ground Port B	• Lower threshold < -0.70 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 -G61-. Refer to ⇒ K3.6.16 noc k Sensor 1 G61, Checking", page 700 . – Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 noc k Sensor 2 G66, Checking", page 702 .
	Knock Sensor Signal Range Check	• Lower threshold < 1.4 – 5.6 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		
P0328 Knock / Combustion Vibration Sensor 1 Circuit High Bank 1 or Single Sensor	Knock Sensor Short To Battery Plus Port A Knock Sensor Short To Battery Plus Port B	• Upper threshold > 1.0 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 -G61-. Refer to ⇒ K3.6.16 noc k Sensor 1 G61, Checking", page 700 . – Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 noc k Sensor 2 G66, Checking", page 702 .
	Knock Sensor Signal Range Check	• Upper threshold > 23.0 – 92.0 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0332 Knock / Combustion Vibration Sensor 2 Circuit Low Bank 2	Knock Sensor Short To Ground Port A	• Lower threshold < -0.70 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking", page 702 .
	Knock Sensor Short To Ground Port B					
	Knock Sensor Signal Range Check	• Lower threshold < 1.4 – 5.6 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		
P0333 Knock / Combustion Vibration Sensor 2 Circuit High Bank 2	Knock Sensor Short To Battery Plus Port A	• Upper threshold > 1.0 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking", page 702 .
	Knock Sensor Short To Battery Plus Port B					
	Knock Sensor Signal Range Check	• Upper threshold > 23.0 – 92.0 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		
P0341 Camshaft Position Sensor "A" Circuit Range/Performance Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	• Signal pattern incorrect		• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0342 Camshaft Position Sensor "A" Circuit Low Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	• Signal voltage permanently low • Crankshaft signal 8.0 [-]		• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 .
P0343 Camshaft Position Sensor "A" Circuit High Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	• Signal voltage permanently high • Crankshaft signal 8.0 [-]		• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 .
P0351 Ignition Coil "A" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0352 Ignition Coil "B" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ "3.6.14 Ignition Coils With Power Output Stage, Checking", page 696 .
P0353 Ignition Coil "C" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ "3.6.14 Ignition Coils With Power Output Stage, Checking", page 696 .
P0354 Ignition Coil "D" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ "3.6.14 Ignition Coils With Power Output Stage, Checking", page 696 .
P0355 Ignition Coil "E" Primary Control Circuit/ Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ "3.6.14 Ignition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0410 AIR System "A"	Air System Check After SAI	• Deviation SAI pressure > 50.0 hPa	• Mass airflow 7.0 – 120.0 kg/h • Delta engine load -10.0 – 10.0%/rev • ECT 5 – 108° C • IAT 5 – 100° C • Altitude < 2,700.0 m • SAI pressure sensor ready	• 6.0 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 . – Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .
P0413 AIR System Switching Valve "A" Circuit Open	Air Valve Open Circuit	• Signal voltage 9.25 – 11.25 V	• Air valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve -N112-. Refer to ⇒ S3.6.26 econdary Air Injection Solenoid Valve N112, Checking", page 723 .
P0414 AIR System Switching Valve "A" Circuit Shorted	Air Valve Short To Ground	• Signal voltage < 6.0 V	• Air valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve -N112-. Refer to ⇒ S3.6.26 econdary Air Injection Solenoid Valve N112,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Air Valve Short To Battery Plus	• Signal current 2.20 – 4.20 A	• Air valve commanded on • Engine speed > 80 RPM			Checking", page 723 .
P0418 AIR System Control "A" Circuit	Air Pump Relay Open Circuit	• Signal voltage 4.50 – 5.50 V	• Pump relay commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0420 Catalyst System Efficiency Below Threshold Bank 1	Catalyst System Measure Of OSC Compared To OSC Of Borderline Catalyst	• Measured OSC / OSC of borderline catalyst measured OSC (HC and NOx-correlated) < 1.0 [-]	• Time after engine start > 343.0 s • Or • Time after dew point > 343.0 s • Delta exhaust mass flow < 25.0 kg/h • Exhaust gas mass flow, lower range 25.0 – 130.0 kg/h (CBUA) • Exhaust gas mass flow, lower range 25.0 – 120.0 kg/h (CBTA) • Exhaust gas mass flow, upper range n.a. • Modeled exhaust gas temp. dynamic < 50 K • Modeled exhaust gas temp. in catalyst system, lower range 500 – 860° C (CBUA) • Modeled exhaust gas temp. in catalyst system, lower range 560 – 860° C (CBTA) • Modeled exhaust gas temp. in catalyst system, upper range n.a. • Minimum modeled exhaust gas temp. in catalyst system > 400° C • For time > 120.0 s • Filtered minimum modeled exhaust gas temp. in catalyst system > 450° C • Engine load 12.8 – 65.3% (CBUA) • Engine load 12.8 – 60.0% (CBTA)	• 40.0 s (CBUA) • 30.0 s (CBTA) • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Three Way Catalytic Converter (TWC). Refer to ⇒ T3.6.27 hree Way Catalytic Converter (TWC), Checking", page 725 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
			• Evap purge loading not high • Engine speed 1,200 – 3,320 RPM • Range between lambda set value and lambda value < 0.02 [-] • Out of lambda range < 2.0 s • Lambda control closed loop • Lambda control not at min or max limit • Number of checks 3.0 [-] • O2S front ready • O2S rear ready • SAS not active • No misfire • O2S front response monitoring in current driving cycle ready			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0441 EVAP System Incorrect Purge Flow	EVAP System Functional Check	• Deviation lambda control < 9.0% • And • Deviation idle control < 40.0%	• Time after engine start n.a. • Engine speed idle • Engine speed deviation < 100 RPM • ECT > 60° C • Or • Substitute ECT > 80° C • IAT > 5° C • Altitude < 2,700.0 m • Lambda control closed loop	• 20.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks", page 7 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0442 EVAP System Leak Detected (Small Leak)	EVAP System Small Leak Pressure Check	• Time for pressure drop < 1.9 s	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Air temperature drop after engine start < 5 K • Intake manifold vacuum > -2,560.0 hPa • Altitude < 2,700.0 m • Vehicle speed >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Restart temperature difference > 52 K • Evap purge valve closed • LDP active • Deep down hill driving • Delta ambient pressure < 7.03 hPa • Or • Engine load not < 19.5 – 45.0% • And • Delta vehicle speed not > -1 km/h	• 180.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks", page 7 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0444 EVAP System Purge Control Valve "A" Circuit Open	EVAP Purge Valve Open Circuit	• Signal voltage > 4.40 – 5.40 V	• EVAP purge valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0455 EVAP System Leak Detected - Large Leak	EVAP System Large Leak Pressure Check	• Time for pressure drop < 0.95 s .	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Air temperature drop after engine start < 8 K • Intake manifold vacuum > -2,560.0 hPa • Altitude < 2,700.0 m • Vehicle speed >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Restart temperature difference > 52 K • Evap purge valve closed • LDP active • Deep down hill driving • Delta ambient pressure < 7.03 hPa • Or • Engine load not < 19.5 – 45.0% • And • Delta vehicle speed not >= -1 km/h	• 180.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks", page 7 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0456 EVAP System Leak Detected (Very Small Leak)	EVAP System Very Small Leak Pressure Check	• Time for pressure drop < 5.8 s	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Air temperature drop after engine start < 3 K • Intake manifold vacuum > -2,560.0 hPa • Altitude < 2,700.0 m • Vehicle speed 0 – 140 od. >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Restart temperature difference > 52 K • Evap purge valve closed • LDP active • Hill driving • Delta ambient pressure -8.0 – 2.0 hPa • Or • Engine load not < 19.5 – 45.0% • And • Delta vehicle speed not >= -1 km/h • Additional: • Vehicle acceleration < 3.80 m/s2 • Delta engine load < 767.98%/seg	• 180.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks", page 7 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0458 EVAP System Purge Control Valve "A" Circuit Low	EVAP Purge Valve Short To Ground	• Signal voltage < 2.15 – 3.25 V	• EVAP purge valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 .
P0459 EVAP System Purge Control Valve "A" Circuit High	EVAP Purge Valve Short To Battery Plus	• Signal current > 2.2 A	• EVAP purge valve commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0491 AIR System Insufficient Flow Bank 1	Air System Flow Check During Catalyst Heating	• SAI pressure measured with SAI pressure sensor vs. modeled < 50.0 – 72.0% • Or • Absolute deviation of raw pressure signal from filtered signal: mean value < 1.5 – 9.0 hPa	• Mass air flow 7.0 – 120.0 kg/h • Delta engine load -10.0 – 10.0%/rev • ECT 5 – 108° C • IAT 5 – 100° C • Altitude < 2,700.0 m • SAI pressure sensor ready	• 45.0 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 . – Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0496	Evaporative Emission System Incorrect Purge Flow - Stuck open	• Actual EVAP pump current vs. difference from last reading > 1.0 [-]	• Minimum ignition angle efficiency 20.0% • Engine speed > 20 RPM • Engine speed Deviation < 100 RPM • Time after engine start > 600.0 s • ECT > 60° C • And • ECT at start < 60° C • AAT > 4 [-] • And • < 35° C • Altitude < 2,700.0 m • O2S front ready • EVAP purge valve commanded off	• 5.0 s	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .
P0501 Vehicle Speed Sensor "A" Circuit Range/ Performance	Vehicle Speed Plausibility Check	• Vehicle speed < 6 km/h	• Engine speed > 2,800 RPM • Engine torque > 120.0 Nm • Vehicle speed sensor no fault	• 10.5 s • Multiple	• 2 DCY	– Check the vehicle speed signal. Refer to ⇒ V3.6.29 ehicle Speed Signal, Checking", page 729 . – Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0506 Idle Control System RPM - Lower Than Expected	Idle Controller Out Of Range Low	• Engine speed deviation < -100 RPM • And • RPM controller torque value >= calculated max value.	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT > -48 °C • IAT > -48 °C • Vehicle speed ready • Evap purge valve closed • External torque request not demanded • For manual transmission: • Engine load < 34.5%	• 7.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0507 Idle Control System RPM - Higher Than Expected	Idle Controller Out Of Range High	• Engine speed deviation > 100 RPM • And • RPM controller torque value <= calculated min. value • Or • RPM controller P-portion and I-portion < -20.0 Nm	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT > -48 °C • IAT > -48 °C • Vehicle speed ready • Evap purge valve closed • External torque request not demanded	• 7.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P050A Cold Start Idle Control System Performance	Cold Start Monitoring Idle Controller Out of Range Low	• Engine speed deviation < -100 RPM • And • RPM controller torque value >= calculated max. value	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT @ start < 143° C • IAT > -48° C • EVAP purge valve closed • External torque request not demanded • Catalyst heating active • For manual transmission: • Engine load < 34.5%	• 5.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
	Cold Start Monitoring Idle Controller Out of Range High	• Engine speed deviation > 100 RPM • RPM controller torque value <= calculated min. value • RPM controller P-portion and I-portion < -20.0 Nm	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT @ start < 143° C • IAT > -48° C • EVAP purge valve closed • External torque request not demanded • Catalyst heating active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P052A Cold Start "A" Camshaft Position Timing Over-Advanced Bank 1	Cold Start Monitoring VVT Actuator Intake Target Error	• Difference between target position vs. actual position > 10° CRK	• Time after engine start >= 10.0 s • Engine speed >= 400 RPM • Modeled oil temperature >= -48° C • Catalyst heating active	• 5.0 s • Once / DCY	• 2 DCY	– Check engine oil for incorrect viscosity or in need of servicing (dirty oil). Oil that is not clear in color may be causing the sensor to operate incorrectly. The engine oil must be clean and of the correct viscosity in order for the sensor to operate properly. Check the vehicle paperwork to determine what oil viscosity has been used and when the last oil change was performed. Change the engine oil if necessary. – Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 .
P0606 ECM/ PCM Processor	Oxygen Sensors Heater Front Out Of Range	• Difference between measured calibration resistance in ECM and set value > 45.0 Ω	• Time after engine start > 40.0 s • Engine speed idle	• 40.0 s • Multiple	• 2 DCY	– Replace the Engine/ Motor Control Module -J623-. Refer to appropriate repair manual.
	Altitude Sensor Plausibility Check	• Signal gradient > 50.0 hPa		• 20.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Signal gradient < -50.0 hPa				
	Altitude Sensor Short To Ground	• Signal voltage < 0.20 V		• 0.2 s • Multiple		
	Altitude Sensor Short To Battery / Open Circuit	• Signal voltage > 4.88 V				
	ECM: WDA Function Monitoring: WDA	• General cause failure		• 0.5 s • Continuous		
		• Internal check failure				
		• Overvoltage detection failure				
	ECM: EEPROM Check	• Check failed				
	ECM: Self Check For Sensor IC internal Hardware Check (Electrical Adjustment Communication, Voltage Supply)	• Check				
	ECM: 5V Supply Voltage Internal Hardware Check	• Under-/overvoltage detection				
	ECM: A/D Converter Power-Up Calibration	• Check failed	• Initialization phase active			
	ECM: A/D Converter Adc-Cannel Conversion		• Initialization phase active • Power-up calibration executed			
	ECM: EGAS Module Function Monitoring: A/D Converter	• Comparison reference voltage with sensor voltage incorrect				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Test voltage check failed				
		• Internal check failed				
	ECM: EGAS Module Function Monitoring: Torque	• Comparison with allowed engine torque incorrect	• Internal engine speed > 600 RPM			
	ECM: EGAS Module Function Monitoring: Engine Speed Deviation	• Difference between calculated and internal engine speed > 320 RPM	• Internal engine speed > 520 RPM			
	ECM: EGAS Module Function Monitoring: Coding	• Internal check failed				
	ECM: EGAS Module Function Monitoring: Ignition Timing					
	ECM: EGAS Module Function Monitoring: Intern	• System reaction incorrect				
	ECM: EGAS Module Function Monitoring: Injection Rate Limitation					
	ECM: EGAS Module Function Monitoring: Accelerator Position	• Internal check failed				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	ECM: EGAS Module Monitoring Module	• Function controller check failed • And • Monitoring module check no failure	• SPI - interface no failure			
	CAN: Internal Fault CAN Controller RAM Check	• RAM error memory checksum error	• Initialization phase • Time after ignition on 500.0 ms	• 0.0 ms • Once / DCY		
P0627 Fuel Pump "A" Control Circuit/ Open	Fuel Pump Relay Open Circuit	• Signal voltage 4.50 – 5.50 V	• Pump relay commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 .
	Fuel Pump Relay Short To Ground	• Signal voltage < 3.0 V				
P0629 Fuel Pump "A" Control Circuit High	Fuel Pump Relay Short To Battery Plus	• Signal current 0.60 – 1.20 A	• Pump relay commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0638 Throttle Actuator Control Range/Performance Bank 1	Throttle Actuator Basic Settings Rationality Check Close Movement	• Time to close to reference point > 0.6 s • And • Reference point 2.88%	• Engine speed 0 RPM • Vehicle speed 0 km/h • ECT > -20° C • IAT > -20° C • Case 1: • Ignition on • Case 2: • Engine shut-off-time 3.0 s • Number of checks 2.0 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
	Throttle Actuator Basic Settings Signal Range Check @ Mechanical Stop Low	• TPS 1 signal voltage not (0.40 – 0.80) V • Or • TPS 2 signal voltage not (4.20 – 4.60) V • Or • TPS1 + TPS2 not (4.82 – 5.18) V	• Engine speed 0 RPM • Vehicle speed 0 km/h • Case 1: • Ignition on • ECT -20 – 115° C • IAT -20 – 143° C • Case 2: • Engine shut-off-time 3.0 s • ECT 5 – 115° C • IAT 5 – 143° C	• 0.3 s • Multiple		
P0641 Sensor Reference Voltage "A" Circuit/Open	ECM: Sensor Reference Circuit A Signal Range Check	• Signal voltage deviation > +/- 0.3 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/Motor Control Module -J623-. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0651 Sensor Reference Voltage "B" Circuit/ Open	ECM: Sensor Reference Circuit B Signal Range Check	• Signal voltage deviation > +/- 0.3 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/ Motor Control Module -J623-. Refer to appropriate repair manual.
P0697 Sensor Reference Voltage "C" Circuit/ Open	ECM: Sensor Reference Circuit C Signal Range Check	• Signal voltage deviation > +/- 0.3 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/ Motor Control Module -J623-. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P117A Bank 1, Oxygen Sensor Correction Center Sensor Control Limit Reached	Fuel System Out Of Range	• I - portion of 3rd lambda control loop > 0.03 [-]	• Engine speed 1,400 – 3,600 RPM • Modeled exhaust gas temp 350 – 1,000° C • Engine load 20.3 – 54.8% • Lambda control closed loop • 2nd lambda control closed loop • 3rd lambda control closed loop • O2S rear ready • Electrical check ready • O2S heater rear ready no fault	• 1,800.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .
P150A Engine Off Timer Performance	Engine-Off-Time Comparison Of Engine Off Time From Instrument Cluster Control Unit With Engine After Run Time	• Difference between engine-off-time and ECM after-run time < -12.0 s	• Key on after ECM after run time active • CAN active	• 6.0 s • Once / DCY	• 2 DCY	– If ignition off B+ is lost to ECM, this code will set. Check power and ground inputs to ECM first. Refer to Wiring Diagrams for pin locations. If all power/ grounds to ECM are

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Difference between engine-off-time and ECM after-run time > 12.0 s	• Key on during ECM after run time active • CAN active			present, replace the Engine/ Motor Control Module -J623-. Refer to appropriate repair manual.
P2088 "A" Camshaft Position Actuator Control Circuit Low Bank 1	VVT Actuator Intake Short To Ground	• Signal voltage < 2.15 – 3.25 V	• Camshaft valve off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 .
P2089 "A" Camshaft Position Actuator Control Circuit High Bank 1	VVT Actuator Intake Short To Battery Plus	• Signal current > 2.2 A	• Camshaft valve on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2096 Post Catalyst Fuel Trim System Too Lean Bank 1	Fuel System Out Of Range	• I-portion of 2nd lambda control loop < -0.040 [-] (CBTA) • I-portion of 2nd lambda control loop < -0.030 [-] (CBUA)	• Modeled exhaust gas temp. 400 – 1,000° C • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • Lambda control not at min or max limit • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front active • O2S heater rear active • Fuel cut off not active • Catalyst heating not active • SAI not active	• 140.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2097 Post Catalyst Fuel Trim System Too Rich Bank 1	Fuel System Out Of Range	• I-portion of 2nd lambda control loop > 0.040 [-] (CBTA) • I-portion of 2nd lambda control loop > 0.030 [-] (CBUA)	• Modeled exhaust gas temp. 400 – 1,000° C • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • Lambda control not at min or max limit • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front active • O2S heater rear active • Fuel cut off not active • Catalyst heating not active • SAI not active	• 140.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking”, page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)”, page 680 .
P2101 Throttle Actuator "A" Control Motor Circuit Range/Performance	Throttle Actuator Rationality Check	• Deviation throttle value angles vs calculated value > 4.0 – 50.0%		• 0.5 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking”, page 726 .
	Throttle Actuator Signal Range Check	• Duty cycle > 80.0% • And • ECM power stage no failure		• 5.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2106 Throttle Actuator Control System - Forced Limited Power	Throttle Actuator Open Circuit	• Internal check	• Duty cycle > 80.0% • Or • Deviation throttle value angle vs. calculated value > 4.0 – 50.0%	• 12.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
	Throttle Actuator Functional Check	• Internal check failed				
	Throttle Actuator Temperature / Current Monitoring					
	Throttle Actuator Short To Battery Plus / Short To Ground	• Internal check				
P2122 Throttle/ Pedal Position Sensor/ Switch "D" Circuit Low	Accelerator Position Sensor 1 Out Of Range Low	• Signal voltage < 0.6 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .
P2123 Throttle/ Pedal Position Sensor/ Switch "D" Circuit High	Accelerator Position Sensor 1 Out Of Range High	• Signal voltage > 4.8 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .
P2127 Throttle/ Pedal Position Sensor/ Switch "E" Circuit Low	Accelerator Position Sensor 2 Out Of Range Low	• Signal voltage < 0.3 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2128 Throttle/ Pedal Position Sensor/ Switch "E" Circuit High	Accelerator Position Sensor 2 Out Of Range High	• Signal voltage > 2.4 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .
P2138 Throttle/ Pedal Position Sensor/ Switch "D"/"E" Voltage Correlation	Accelerator Position Sensor 1 And 2 Rationality Check	• Signal voltage sensor 1 vs. 2 > 0.167 – 0.703 V	• Signal voltage sensor 1 > 445.0 mV • Signal voltage sensor 2 > 445.0 mV	• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2177 System Too Lean Off Idle Bank 1	Fuel System Too Lean @ Part Load	• Adaptive value > 28.0%	• Time after engine start n.a. • Engine speed 1,320 – 4,600 RPM • Engine load 25.0 – 46.0% • Mass air flow 45.0 – 300.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Lambda control closed loop • Evap purge valve closed • If low fuel signal then wait until fuel consumption n.a.	• 25.0 s • Multiple	• 2 DCY	– Check the vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2178 System Too Rich Off Idle Bank 1	Fuel System Too Rich @ Part Load	• Adaptive value < -28.0%	• Time after engine start n.a. • Engine speed 1,320 – 4,600 RPM • Engine load 25.0 – 46.0% • Mass air flow 45.0 – 300.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Lambda control closed loop • Evap purge valve closed	• 25.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						Manifold Sensor GX9, Checking", page 698 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2181 Cooling System Performance	Coolant System Performance Cooling System Performance Not In A Expect Range	• Thers_03: • Cooling system temperature to low after a sufficient air mass flow integral 75° C	• Thres_01: • Begin of air mass integration when engine temp. 30° C • Thers_02: • ECT @ start -10 – 60° C • AAT > -10° C • Fuel cut off not active • And • Engine load 14.0 – 95.0% • Air mass_01: • Integrated air mass depending on engine temp. at start and AAT 4.0 – 13.5 kg/h (CBTA) • Integrated air mass depending on engine temp. at start and AAT 4.0 – 13.47 kg/h (CBUA) • Depending on temp. at engine start and min. observed AAT for longer than 120.0 – 180.0 s • Depending on temp. at engine start and min. observed AAT for more than 4.0 – 12.0 kg • At time of fault decision: • Average air mass flow 35.0 – 280.0 kg/h • Average vehicle speed 30 – 120 km/h	• 2.0 s • Once / DCY	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2184 Engine Coolant Temperature Sensor 2 Circuit Low	Fan Control Coolant Temperature Sensor Short To Ground	• ECT outlet > 140° C		• 2.0 s • Continuous	• 2 DCY	– Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .
P2185 Engine Coolant Temperature Sensor 2 Circuit High	Fan Control Coolant Temperature Sensor Short To Battery / Open Circuit	• ECT outlet < -40° C		• 2.0 s • Continuous	• 2 DCY	– Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2187 System Too Lean at Idle Bank 1	Fuel System Too Lean @ Idle	• Adaptive value > 5.02%	• Time after engine start n.a. • Engine speed < 860 RPM • Mass air flow < 35.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Delta part load adaptation ready • Lambda control closed loop • Evap purge valve closed • If low fuel signal then wait until fuel consumption n.a.	• 40.0 s • Multiple	• 2 DCY	– Check the vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2188 System Too Rich at Idle Bank 1	Fuel System Too Rich @ Idle	• Adaptive value < -5.02%	• Time after engine start n.a. • Engine speed < 860 RPM • Mass air flow < 35.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Delta part load adaptation ready • Lambda control closed loop • Evap purge valve closed • If low fuel signal then wait until fuel consumption n.a.	• 40.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						Manifold Sensor GX9, Checking”, page 698 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking”, page 688 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2195 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 1	Oxygen Sensors Front Out Of Range	• Delta lambda of 2nd lambda control loop > 0.065 [-] (CBTA) • Delta lambda of 2nd lambda control loop > 0.070 [-] (CBUA)	• Modeled exhaust gas temp 400 – 1,000° C • Delta engine load < 12.0% • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front ready • O2S heater rear ready • Fuel cut off not active • Catalyst heating not active • SAI not active • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V	• 100.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2196 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 1	Oxygen Sensors Front Out Of Range	• Delta lambda of 2nd lambda control loop < -0.065 [-] (CBTA) • Delta lambda of 2nd lambda control loop < -0.070 [-] (CBUA)	• Modeled exhaust gas temp 400 – 1,000° C • Delta engine load < 12.0% • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front ready • O2S heater rear ready • Fuel cut off not active • Catalyst heating not active • SAI not active • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V	• 100.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2237 O2 Sensor Positive Current Control Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Pump Current (IP)	• O2S signal front < 1.70 V • And • Fuel cutoff > 3.0 s	• O2S ceramic temp > 720° C • Electrical adjustment not active • Heater control closed loop • Evap purge valve ready	• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
		• O2S signal front 1.49 – 1.51 V • And • Delta lambda controller > 0.10 [-]	• O2S ceramic temp > 720° C • Lambda modulation > 0.02 [-] • Lambda control closed loop • Heater control closed loop	• 6.5 s • Multiple		
P2243 O2 Sensor Reference Voltage Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Nernst Voltage (UN)	• O2S signal front > 4.70 V • And • Internal resistance > 950.0 Ω	• Heater control active	• 25.5 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
		• O2S signal front < 0.20 V • And • Internal resistance > 950.0 Ω				
P2251 O2 Sensor Negative Current Control Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Virtual Mass (VM)	• O2S signal front 1.47 – 1.53 V • And • Internal resistance > 950.0 Ω	• Modeled exhaust gas temp < 750 Ω • No fuel cutoff > 2.0 s • Heater control active	• 30.5 s	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2257 AIR System Control "A" Circuit Low	Air Pump Relay Short To Ground	• Signal voltage < 3.0 V	• Pump relay commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .
P2258 AIR System Control "A" Circuit High	Air Pump Relay Short To Battery Plus	• Signal current 0.60 – 1.20 A	• Pump relay commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .
P2270 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF Stuck Lean (If Sensor Stuck Lean: 30.0% Enrichment) (CBTA)	• O2S signal rear not oscillating at reference < 600.0 mV	• Mass air flow 22.0 – 120.0 kg/h (CBTA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 30.0 s (CBTA) • 2nd lambda control closed loop	• 210.0 s (CBTA) • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear 2 - Point - LSF Stuck Lean (If Sensor Stuck Lean: 20.0 - 30.0% Closed Loop Enrichment) (CBUA)		• Mass air flow 30.0 – 120.0 kg/h (CBUA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 10.0 s (CBUA) • 2nd lambda control closed loop	• 80.0 s (CBUA) • Multiple		– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .
P2271 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF Stuck Rich (If Sensor Stuck Rich: 7.0% Enleanment) If Enleanment Is Not Successful: Waiting For Next Fuel Cut Off (CBTA)	(CBTA) • O2S signal rear not oscillating at reference > 600.0 mV	(CBTA) • Mass air flow 22.0 – 120.0 kg/h (CBTA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 30.0 s (CBTA) • Fuel cut off > 3.0 s • 2nd lambda control closed loop	• 210.0 s (CBTA) • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear (Binary Check Of Response Time At Fuel Cut Off (CBTA)	(CBTA) • Response time at fuel cut off > 6.0 s • And • Measurement range from fuel cut off to voltage threshold <= 191.0 mV • And • Number of checks (initial phase) >= 1.0 [-] • Or • Measurement range from fuel cut off to O2 mass flow threshold >= 7,000.0 mg • And • Number of checks (initial phase) >= 1.0 [-]	(CBTA) • Rich voltage (enable) >= 548.0V • Lean voltage <= 191.0V • O2S rear ready • Rear O2-sensor signal oscillating • Monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2-Sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131,070.0 Ω	• 6.0 s (CBTA) • Multiple		
	Oxygen Sensors Rear 2 - Point - LSF Stuck Rich (If Sensor Stuck Rich: 7.0% - 15.0% Closed Loop Enleanment) If Enleanment Is Not Successful: Waiting For Next Fuel Cut Off (CBUA)	(CBUA) • O2S signal rear not oscillating at reference > 600.0 mV	(CBUA) • Mass air flow 30.0 – 120.0 kg/h (CBUA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 10.0 s (CBUA) • Fuel cut off > 3.0 s • 2nd lambda control closed loop	• 80.0 s (CBUA) • Multiple		– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)”, page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear (Binary LSF) Check Of Response Time At Fuel Cut Off (CBUA)	(CBUA) • Response time at fuel cut off > 6.0 s • And • Measurement range from fuel cut off to voltage threshold <= 191.0 mV • And • Number of checks (initial phase) >= 1.0 [-] • Or • Measurement range from fuel cut off to O2 mass flow threshold >= 4,000.0 mg • And • Number of checks (initial phase) >= 1.0 [-]	(CBUA) • Rich voltage (enable) >= 548.0V • Lean voltage n.a. • O2S rear ready • Rear O2-sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131,070.0 Ω	• 4.5 s (CBUA) • Multiple		
P2274 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF Stuck Lean (If Sensor Stuck Lean: 30.0% Enrichment)	• O2S signal rear not oscillating at reference < 600.0 mV	• Mass air flow 22.0 – 120.0 kg/h • Modeled exhaust gas temp. > 350° C • O2S rear readiness > 30.0 s • 2nd lambda control closed loop	• 210.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)”, page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2275 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF Stuck Rich (If Sensor Stuck Rich: 7.0% Enleanment) If Enleanment Is Not Successful: Waiting For Next Fuel Cut Off	• O2S signal rear not oscillating at reference > 600.0 mV	• Mass air flow 22.0 – 120.0 kg/h • Modeled exhaust gas temp. > 350° C • O2S rear readiness > 30.0 s • Fuel cut off active • 2nd lambda control closed loop	• 210.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .
	Oxygen Sensors Rear (Binary LSF) Check Of Response Time At Fuel Cut Off	• Response time at fuel cut off > 6.0 s • And • Measurement range from fuel cut off to voltage threshold <= 191.0 mV • And • Number of checks (initial phase) >= 1.0 [-] • Or • Measurement range from fuel cut off to O2 mass flow threshold >= 7,000.0 mg • And • Number of checks (initial phase) >= 1.0 [-]	• Rich voltage (enable) >= 548.0V • Lean voltage n.a. • O2S rear ready • Rear O2 - sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131,070.0 Ω	• 4.5 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2279 MAP/ MAF - Throttle Position Correlation	Leak to Intake Manifold Adaptation Value Monitoring	• Offset value throttle mass flow > 13.0 kg/h	• Desired mass flow 0.0 – 25.0 kg/h • EVAP purge valve closed • EGR off	• 10.0 s • Multiple	• 2 DCY	• Check for air leaks near the throttle body, oil fill cap not tight or oil dipstick not seated in tube. Also check for any engine gaskets that can cause additional air to enter the crankcase can set this fault as the PCV system is not metered. If a vacuum leak or crankcase seal is the cause, the idle may be rough or unstable. – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 . – Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regu-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						lator Valve 1 N80, Checking", page 688 .
P2300 Ignition Coil "A" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ "3.6.14 Ignition Coils With Power Output Stage, Checking", page 696 .
P2301 Ignition Coil "A" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ "3.6.14 Ignition Coils With Power Output Stage, Checking", page 696 .
P2303 Ignition Coil "B" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ "3.6.14 Ignition Coils With Power Output Stage, Checking", page 696 .
P2304 Ignition Coil "B" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ "3.6.14 Ignition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2306 Ignition Coil "C" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2307 Ignition Coil "C" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2309 Ignition Coil "D" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2310 Ignition Coil "D" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2312 Ignition Coil "E" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2313 Ignition Coil "E" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2400 EVAP System Leak Detection Pump Control Circuit/ Open	LDP Open Circuit	• Signal voltage > 4.40 – 5.60 V	• LDP commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump - V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump - V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2401 EVAP System Leak Detection Pump Control Circuit Low	LDP Short To Ground	• Signal voltage < 2.15 – 3.25 V	• LDP commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)”, page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)”, page 706 .
P2402 EVAP System Leak Detection Pump Control Circuit High	LDP Short To Battery Plus	• Signal current > 3.0 A	• LDP commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)”, page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)”, page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2403 EVAP System Leak Detection Pump Sense Circuit/ Open	Reed Sensor Rationality Check Unable To Close	• Low signal voltage > 0.5 s	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Altitude < 2,700.0 m • Integrated purge flow > 29.90 g • Restart temperature difference > 52 K • Vehicle speed >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Evap purge valve ready • LDP commanded off	• 0.5 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .
P2404 EVAP System Leak Detection Pump Sense Circuit Range/ Performance	Reed Sensor Rationality Check Unable To Open	• High signal voltage > 12.0 s • And • Number of checks 30.0 [-]	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Altitude < 2,700.0 m • Intake manifold vacuum > -2,560.0 hPa • Restart temperature difference > 52 K • Vehicle speed >= 0 km/h	• 12.0 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Cumulative time of high signal voltage during pumping > 10.0 s	• Vehicle speed ones > 30 km/h • Selected gear any drive • Evap purge valve closed, ready • LDP commanded on	• 120.0 s • Once / DCY		
P240A EVAP System Leak Detection Pump Heater Control Circuit/ Open	EVAP Leak Detection Pump Open Circuit	• Signal voltage > 4.7 – 5.4 V	• Evap pump heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 , as applicable.
P240B EVAP System Leak Detection Pump Heater Control Circuit Low	EVAP Leak Detection Pump Short To Ground	• Signal voltage < 2.74 – 3.26 V	• Evap pump heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 , as applicable.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P240C EVAP System Leak Detection Pump Heater Control Circuit High	EVAP Leak Detection Pump Short To Battery Plus	• Signal current > 2.2 – 4.0 A	• Evap pump heater commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 , as applicable.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2407 EVAP System Leak Detection Pump Sense Circuit Intermittent/ Erratic	EVAP Leak Detection Pump Signal Check During Engine Off	• Fluctuation of evap pump current during reference measurement > 1 mA • Or • Drop of evap pump current during pump phase > 6 mA • For time >= 3.0 s	• Engine temperature @ engine start >= 4° C • Difference between ECT and IAT @ engine start <= 15 K • Ambient air temperature < 35; > 4° C • Altitude <= 2700 m • Time since engine start in preceding dcy >= 600.0 s • Change in battery voltage during monitoring < 1.0 V • Engine off time >= 5.0 s • Vehicle speed 0 km/h • Evap purge adaptation < 5.0 [-] • Deviation of filtered evap pump current during reference measurement within range <= 1 mA • Change in relative evap pump current during monitoring n.a. • Within time n.a. • (During ECM keep alive-time after ignition off, max. time) < 900.0 s • Airbag not activated • (After MIL illumination because of any EVAP leakage the monitor is only activated every) 1 dcys	• 800.0 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump - V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 , as applicable.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2414 O2 Sensor Exhaust Sample Error Bank 1 Sensor 1	Oxygen Sensors Front Signal Range Check (Check For Sensor At Ambient Air)	• Threshold 1: • Signal voltage 3.10 – 4.77 V • Threshold 2: • Signal voltage 2.50 – 3.06 V • Depending on gain factor that actual is used for sensor	• Lambda value < 1.6 [-] • O2S ceramic temp. > 715° C • Fuel cut off not active • Heater control closed loop • SAI not active • If low fuel signal then wait > 0.0 s	• 15.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
P2431 AIR System Air Flow/ Pressure Sensor Circuit Range/ Performance Bank 1	Air System Pressure Sensor Rationality Check	• Difference between SAI pressure and ambient pressure not (-60.0 – 60.0_ hPa	• SAI done	• 0.5 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 .
P2432 AIR System Air Flow/ Pressure Sensor Circuit Low Bank 1	Air System Pressure Sensor Signal Range Check	• Signal voltage < 0.5 V		• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 .
P2433 AIR System Air Flow/ Pressure Sensor Circuit High Bank 1	Air System Pressure Sensor Signal Range Check	• Signal voltage > 4.5 V		• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2440 AIR System Switching Valve Stuck Open Bank 1	Air System Check After SAI	• SAI pressure measured with SAI pressure sensor vs. modeled while SAI valve closed < 65.0%	• ECT 5 – 108° C • IAT 5 – 100° C • Altitude < 2,700.0 m • SAI pressure sensor ready	• 45.0 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve -N112-. Refer to ⇒ S3.6.26 econdary Air Injection Solenoid Valve N112, Checking", page 723 . – Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2450 EVAP System Switching Valve Performance/ Stuck Open	EVAP Leak Detection Pump Rationality Check During Engine Off	• Evap pump current difference between reference measurement to idle <= 3 mA	• Engine temperature @ engine start >= 4° C • Difference between ECT and IAT @ engine start <= 15 K • Ambient air temperature < 35; > 4° C • Altitude <= 2,700 m • Time since engine start in preceding dcy >= 600.0 s • Change in battery voltage during monitoring < 1.0 V • Engine off time >= 5.0 s • Vehicle speed 0 km/h • Evap purge adaptation < 5.0 [-] • No sudden change in evap pump current (filling event) < 2; > -1 mA • Deviation of filtered evap pump current during reference measurement within range <= 1.0 mA • Change in relative evap pump current during monitoring n.a. • Within time n.a. • (During ECM keep alive-time after ignition off, max. time) < 900.0 s • Airbag not activated • (After MIL illumination because of any EVAP leakage the mon-	• 13.5 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)”, page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)”, page 706 , as applicable.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
			itor is only activated every) 1 dcys			
P2626 O2 Sensor Pumping Current Trim Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Adjustment Voltage (IA)	• O2S signal front > 4.77 V	• Modeled exhaust temp. < 750° C • O2S ceramic temp. > 720° C • Fuel cut off active • Heater control closed loop • If low fuel signal then wait > 0.0 s	• 2.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
P3081 Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	Engine Coolant Temperature Sensor Rationality Measured Engine Coolant Temp. Below Reference Model	• Range_01: • Measured engine coolant temp. not within in a range of the reference model > 11 K	• Modmax_01: • Maximum reference temperature 60° C	• 4.0 s • Multiple	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 .
U0001 High Speed CAN Communication Bus	CAN: CAN-Bus Reading Back Sent Message (Powertrain)	• CAN message no feedback	• Time after ignition on 500.0 ms	• 250.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .
U0002 High Speed CAN Communication Bus Performance	CAN: CAN-Bus CAN Communication Check (Powertrain)	• Global time out receiving no message	• Time after ignition on 500.0 ms	• 450.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
U0101 Lost Communication with TCM	CAN: TCM CAN Communication With TCM	• Received CAN message no message	• Time after ignition on 500.0 ms	• 500.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance between the Transmission Control Module to the Engine/ Motor Control Module - J623-. Refer to ⇒ C3.6.5 AN-Bus Terminal Resistance, Powertrain, Checking", page 678 .
U0121 Lost Communication With Anti-Lock Brake System (ABS) Control Module "A"	CAN: Brake Unit CAN Communication With Brake Unit	• Received CAN message no message	• Time after ignition on 500.0 ms	• 440.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .
U0146 Lost Communication With Gateway "A"	CAN: Gateway CAN Communication With Gateway	• Received CAN message no message	• Time after ignition on 500.0 ms	• 1,000.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
U0155 Lost Communication With Instrument Panel Cluster (IPC) Control Module	CAN: Instrument Cluster CAN Communication With Instrument Cluster Module	• Received CAN message no message	• Time after ignition on 500.0 ms	• 500.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .
U0302 Software Incompatibility With Transmission Control Module	CAN: TCM CAN Communication With TCM	• Received AT vehicle data TCM signal	• Time after ignition on 500.0 ms	• 100.0 ms • Continuous	• 2 DCY	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Transmission Control Module. Refer to appropriate repair manual.
U0402 Invalid Data Received From TCM	CAN: TCM CAN Communication With TCM	• Received data implausible message	• Time after ignition on 500.0 ms	• 60.0 ms • Continuous	• 2 DCY	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Transmission Control Module. Refer to appropriate repair manual.
U0415 Invalid Data Received From Anti-Lock Brake System (ABS) Control	CAN: Vehicle Speed Sensor CAN Communication With Vehicle Speed Sensor	• Speed sensor signal: initialization error 327.08 km/h • Speed sensor signal: low voltage error 327.25 km/h		• 1,980.0 ms	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 . – Check the vehicle

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
Module "A"		• Speed sensor signal: sensor error 327.42 km/h		• 480.0 ms • Continuous		speed signal. Refer to ⇒ V3.6.29 ehicle Speed Signal, Checking", page 729 .
		• Vehicle speed >= 325 km/h		• 2,100.0 ms • Continuous		
		• Speed sensor signal: out of range 326.39 km/h		• 480.0 ms • Continuous		
	CAN: Brake Unit CAN Communication With Brake Unit	• Received data implausible message	• Time after ignition on 500.0 ms	• 60.0 ms • Continuous		
U0422 Invalid Data Received From Body Control Module	CAN: Ambient Air Temperature Sensor Communication With Instrument Cluster Module	• Ambient temperature value (initialization) 0.0 h [-]	• Key on • Status ambient temperature from instrument cluster no fault • Electrical check ambient temperature sensor no fault	• 3.0 s • Multiple	• 2 DCY	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Body Control Module. Refer to appropriate repair manual.
U0423 Invalid Data Received From Instrument Panel Cluster Control Module	CAN: Instrument Cluster CAN Communication With Instrument Cluster Module	• Received CAN message implausible message	• Time after ignition on 500.0 ms	• 600.0 ms • Continuous	• 2 DCY	– Check for correct software version and VIN or update software for the IPC Module if available. If OK, replace the Instrument Cluster Control Module -J285-. Refer to appropriate repair manual.
	CAN: Ambient Air Temperature Sensor Communication With Instrument Cluster Module (CBTA)	• Ambient temperature value (initialization) 0.0 h [-]	• Key on • Status ambient temperature from instrument cluster no fault • Electrical check ambient temperature sensor no fault	• 3.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
U0447 Invalid Data Received From Gateway "A"	CAN: Gateway CAN Communication With Gateway	• Received data implausible message	• Time after ignition on 500.0 ms	• 300.0 ms • Continuous	• 2 DCY	Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

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DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P000A "A" Camshaft Position Slow Response Bank 1	VVT Actuator Intake Slow Response	• Difference between target position vs. actual position > 8 – 12° CRK (CBTA) • Difference between target position vs. actual position > 8° CRK (CBUA) • And • Adjustment angle > 3° CRK	• Time after engine start > 1.5 – 3.0 s • Engine speed 600 – 6,320 RPM • Oil temperature -48 – 143° C • Frequency (normal operation) 7.0 times [-] (CBTA) • Frequency (normal operation) 4.0 times [-] (CBUA) • Or (CBTA) • Frequency (CSM) 1.0 times [-] (CBTA)	• 21.0 (CBTA) • 12.0 s (CBUA) • Multiple	• 2 DCY	– Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0010 "A" Camshaft Position Actuator "A" Control Circuit/Open Bank 1	VVT Actuator Intake Open Circuit	• Signal voltage > 4.40 – 5.60 V	• Camshaft valve off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0011 "A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	VVT Actuator Intake Target Error	• Difference between target position vs. actual position > 8 – 12° CRK (CBTA) • Difference between target position vs. actual position > 8° CRK (CBUA) • And • Adjustment angle > 3° CRK	• Time after engine start > 1.5 – 3.0 s • Engine speed 600 – 6,320 RPM • Oil temperature -48 – 143° C • Frequency (normal operation) 7.0 times [-] (CBTA) • Frequency (normal operation) 4.0 times [-] (CBUA) • Or (CBTA) • Frequency (CSM) 1.0 times [-] (CBTA)	• 21.0 (CBTA) • 12.0 s (CBUA) • Multiple	• 2 DCY	– Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0016 Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	Camshaft Position Sensor Inlet Angular Offset Check	• Permissible deviation < -13.5° CRK • Or • Permissible deviation > 13.5° CRK		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 .
P0030 HO2S Heater Control Circuit Bank 1 Sensor 1	Oxygen Sensors Heater Front Open Circuit	• Heater voltage 2.34 – 3.59 V	• Time after engine start > 5.0 s • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0031 HO2S Heater Control Circuit Low Bank 1 Sensor 1	Oxygen Sensors Heater Front Short To Ground	• Heater voltage < 2.34 V	• Time after engine start > 5.0 s • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
P0032 HO2S Heater Control Circuit High Bank 1 Sensor 1	Oxygen Sensors Heater Front Short To Battery Plus	• Heater voltage > 3.59 V	• Time after engine start > 5.0 s • Heater commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0036 HO2S Heater Control Circuit Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Open Circuit	• Heater voltage 4.50 – 5.50 V	• Engine speed > 80 RPM (CBTA) • Time after engine start > 5.0 s (CBUA) • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0037 HO2S Heater Control Circuit Low Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Ground	• Heater voltage < 3.0 V	• Engine speed > 80 RPM (CBTA) • Time after engine start > 5.0 s (CBUA) • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0038 HO2S Heater Control Circuit High Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Battery Plus	• Heater current 2.70 – 5.50 A	• Engine speed > 80 RPM (CBTA) • Time after engine start > 5.0 s (CBUA) • Heater commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0042 HO2S Heater Control Circuit Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Open Circuit	• Heater voltage 4.50 – 5.50 V	• Engine speed > 80 RPM • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0043 HO2S Heater Control Circuit Low Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Ground	• Heater voltage < 3.0 V	• Engine speed > 80 RPM • Heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0044 HO2S Heater Control Circuit High Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Short To Battery Plus	• Heater current 2.70 – 5.50 A	• Engine speed > 80 RPM • Heater commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .
P0070 Ambient Air Temperature Sensor Circuit "A"	Ambient Air Temperature Sensor Short To Battery / Open Circuit	• Ambient air temperature < -50° C	• CAN active	• 6.0 s • Multiple	• 2 DCY	– Check the Outside Air Temperature Sensor -G17-. Refer to ⇒ O3.6.21 utside Air Temperature Sensor G17, Checking", page 711 . – Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0071 Ambient Air Temperature Sensor Circuit "A" Range/ Performance	Ambient Air Temperature Sensor Range/ Performance	• Diff. ECT vs. IAT at engine start (depending on engine off time) < 24.75° C • And • Diff. IAT vs. AAT at engine start (depending on engine off time) > 24.75° C • And • Diff. AAT vs. ECT at engine start (depending on engine off time) > 24.75° C	• Engine off time > 6.0 h • Blockheater • ECT >= 143° C • Time after engine start 2.0 s • Or • Diff. ECT vs. ECT outlet <= 20° C • Time after engine start 2.0 s • Solar radiation case 1: • AAT @ start <= 2° C • Minus • AAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s • Solar radiation case 2: • IAT @ start <= 2° C • Minus • IAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s	• 60.0 s • Once / DCY	• 2 DCY	– Check the Outside Air Temperature Sensor - G17-. Refer to ⇒ O3.6.21 utside Air Temperature Sensor G17, Checking", page 711 . – Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0072 Ambient Air Temperature Sensor Circuit "A" Low	Ambient Air Temperature Sensor Short To Ground	• Ambient air temperature > 87° C	• CAN active	• 6.0 s • Multiple	• 2 DCY	– Check the Outside Air Temperature Sensor -G17-. Refer to ⇒ O3.6.21 utside Air Temperature Sensor G17, Checking”, page 711 . – Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking”, page 676 .
P0106 Manifold Absolute Pressure/Barometric Pressure Sensor Circuit Range/Performance	Manifold Pressure Sensor Rationality Check Low	• Difference manifold pressure - lower threshold model < 0.0 hPa • Model range 0.0 – 800.0 hPa	• Time after engine start n.a.	• 450.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking”, page 726 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking”, page 698 .
	Manifold Pressure Sensor Rationality Check High	• Difference manifold pressure - lower threshold model > 0.0 hPa • Model range 650.0 – 1,080.0 hPa				
	Manifold Pressure Sensor Rationality Check	• Diff. altitude sensor signal vs. manifold pressure signal at engine start > 60.0 hPa	• Time after engine start < 25.0 s • Engine speed < 330 RPM			
	Manifold Pressure Sensor Adaptation Value Monitoring	• Offset value manifold pressure for load calculation in driving condition range 2.0 > 55.0 hPa	• Driving condition range 1 (omsna): • Engine speed < 800 RPM			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Offset value manifold pressure for load calculation in driving condition range 2.0 < -60.0 hPa	• Desired mass flow 5.0 – 25.0 kg/h • Delta adaptation value range 1.0 < 0.10 kg/h • For time 1.0 s • Driving condition range 2 (opsra): • Engine speed > 1,400 RPM • Manifold pressure < 425.0 hPa • Delta adaptation value range 2.0 < 2.97 hPa • For time 8.0 s • Driving condition range 3 (opua): • Desired mass flow > 40.0 kg/h • Manifold pressure > 550.0 hPa • Delta adaptation value range 3.0 < 2.97 hPa • For time 5.0 s • General: • Engine operation in every driving condition >= 2.0 times • Diagnosis evap purge system not active • Engine speed 500 – 6,000 RPM • Manifold pressure > 0.0 hPa • Ratio manifold pressure to ambient pressure < 0.85 [-]			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0107 Manifold Absolute Pressure/Barometric Pressure Sensor Circuit Low	Manifold Pressure Sensor Short To Ground	• Signal voltage < 0.20 V		• 1.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .
P0108 Manifold Absolute Pressure/Barometric Pressure Sensor Circuit High	Manifold Pressure Sensor Short To Battery / Open Circuit	• Signal voltage > 4.86 V		• 1.0 s • Continuous	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0111 Intake Air Temperature Sensor 1 Circuit Range/Performance Bank 1	Intake Air Temperature Rationality Check	• Diff. ECT vs. IAT at engine start (depending on engine off time) > 24.75° C • And • Diff. IAT vs. AAT at engine start (depending on engine off time) > 24.75° C • And • Diff. AAT vs. ECT at engine start (depending on engine off time) < 24.75° C	• Engine off time > 6.0 h • Blockheater • ECT >= 143° C • Time after engine start 2.0 s • Or • Diff. ECT vs. ECT outlet <= 20° C • Time after engine start 2.0 s • Solar radiation case 1: • AAT @ start <= 2° C • Minus • AAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s • Solar radiation case 2: • IAT @ start <= 2° C • Minus • IAT @ condition: • Vehicle speed > 20 km/h • For time > 5.0 s	• 60.0 s • Once / DCY	• 2 DCY	– Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 . – Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0112 Intake Air Temperature Sensor 1 Circuit Low Bank 1	Intake Air Temperature Sensor Short To Ground	• IAT > 130° C		• 5.0 s • Multiple	• 2 DCY	– Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 . – Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0113 Intake Air Temperature Sensor 1 Circuit High Bank 1	Intake Air Temperature Sensor Short To Battery / Open Circuit	• IAT < -46° C		• 5.0 s • Multiple	• 2 DCY	– Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 . – Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0116 Engine Coolant Temperature Sensor 1 Circuit Range/Performance	Engine Coolant Temperature Sensor Stuck Low	• Thres_01[f(ECT)]: Temp_01 • No change on signal 1.5 K	• ECT @ start n.a. • ECT 50 – 75° C • Cold start n.a. • Temp_02 • Substitute ECT > -45° C • Driving condition L: • Vehicle speed 0 – 20 km/h • Mass air flow 4.0 – 40.0 kg/h • Time required / > 10.0 s • Frequency 3.0 times • And • Driving condition H: • Vehicle speed 50 – 150 km/h • Mass air flow 32.0 – 352.0 kg/h • Time required / > 40.0 s • Frequency once	• 70.0 s • Once / DCY	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Engine Coolant Temperature Sensor Stuck High		• Temp_01 • ECT @ start n.a. • ECT 105 – 140° C • Cold start n.a. • Temp_02 • Substitute ECT > -45° C • Driving condition L: • Vehicle speed 0 – 20 km/h • Mass air flow 4.0 – 40.0 kg/h • Time required / > 10.0 s • Frequency 3.0 times • And • Driving condition H: • Vehicle speed 50 – 150 km/h • Mass air flow 32.0 – 352.0 kg/h • Time required / > 40.0 s • Frequency once			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Engine Coolant Temperature Sensor Stuck In Range	• Signal in range 75.0 – 105.0° C • And • No change on signal n. a.	• Cold start detected • Stuck high n.a. • Temp_01 • ECT @ start n.a. • Temp_02 • Substitute ECT n.a. • Driving condition L: • Vehicle speed n.a. • Mass air flow n.a. • time required / n.a. • Frequency n.a. • And • Driving condition H: • Vehicle speed n.a. • Mass air flow n.a. • Time required / n.a. • Frequency n.a.	• 2.0 s • Once / DCY		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0117 Engine Coolant Temperature Sensor 1 Circuit Low	Engine Coolant Temperature Sensor Short To Ground	• ECT > 140° C		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0118 Engine Coolant Temperature Sensor 1 Circuit High	Engine Coolant Temperature Sensor Short To Battery / Open Circuit	• ECT < -40° C		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.
P0121 Throttle/ Pedal Position Sensor/ Switch "A" Circuit Range/ Performance	Throttle Position Sensor 1 Rationality Check	• TPS1-TPS2 > 6.30% • And • • Actual TPS1 - calc. value > actual TPS2 - calc. value • Or • TPS1 - calc. value > 9.0%	• Engine speed > 480 RPM	• 0.3 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0122 Throttle/ Pedal Position Sensor/ Switch "A" Circuit Low	Throttle Position Sensor 1 Out Of Range Low	• Signal voltage < 0.20 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0123 Throttle/ Pedal Position Sensor/ Switch "A" Circuit High	Throttle Position Sensor 1 Out Of Range High	• Signal voltage > 4.81 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0130 O2 Sensor Circuit Bank 1 Sensor 1	Oxygen Sensors Front Out Of Range	• O2S ceramic temp. < 640° C	• Modeled exhaust temp > 300° C • Fuel cut off not active	• 15.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0131 O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	Oxygen Sensors Front Signal Range Check	• Short to ground • Virtual mass (VM) < 1.75 V • Or • Nernst voltage (UN) < 1.50 V • Or • Adjustment voltage (IA) < 0.30 V • Or • Adjustment voltage (IP) < 0.30 V		• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
P0132 O2 Sensor Circuit High Voltage Bank 1 Sensor 1	Oxygen Sensors Front Signal Range Check	• Short to battery • Virtual mass (VM) > 3.25 V • Or • Nernst voltage (UN) > 4.40 V • Or • Adjustment voltage (IA) > 7.0 V • Or • Adjustment voltage (IP) > 7.0 V		• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0133 O2 Sensor Circuit Slow Response Bank 1 Sensor 1	Oxygen Sensors Front Response Rate Monitoring, Area Ratio	• Symmetric fault: • Lower value of both area ratios R2L and L2R < 0.25 [-] (CBTA) • Lower value of both area ratios R2L and L2R < 0.20 [-] (CBUA) • And • Difference of R2L area ratio vs. L2R area ratio -0.40 – 0.40 [-] • Asymmetric fault: • Lower value of both area ratios R2L and L2R < 0.25 [-] (CBTA) • Lower value of both area ratios R2L and L2R < 0.35 [-] (CBUA) • And • Difference of R2L area ratio vs. L2R area ratio not (-0.40 – 0.40) [-] • General: • Lower value of both counters for area ratio R2L and L2R >= 5 times	• O2S front - min. operation temperature is reached > 720° C • O2S front - time since operation readiness > 40.0 s • Engine speed 1,160 – 2,720 RPM • Engine load 13.99 – 45.0% • Gradient of engine load <= 7.99% • Exhaust system lag time calculation 0.15 – 0.33 s • Gradient of exhaust system lag time calculation <= 0.0 s • ECT >= 10° C • Catalyst temperature >= 450° C • Lambda control set-point prior to diagnostic fuel steps A/F-ratio stoichiometric • Relative fuel amount from wall applied compensation and evap purge <= 0.1 [-] • Canister load < 15.0 [-] • Time since last measurement > 3.0 s • 2nd lambda control loop not active • Forced lambda oscillation not active • SAI not active • Tank leakage detection not active	• 67.0 s • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
			• Diagnosis evap purge system not active • Fuel cut off for any cylinders not active • Open circuit pump current (IP) ready • Only Flex fuel systems without ethanol sensor: • Ethanol concentration adaptation not active			
P0135 O2 Sensor Heater Circuit Bank 1 Sensor 1	Oxygen Sensors Heater Front Out Of Range High	• O2S ceramic temperature < 720° C • And • Heater duty cycle > 100.0%	• Modeled exhaust gas temp. > 550° C • Heater control active	• 70.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10 Checking", page 716 .
	Oxygen Sensors Heater Front Rationality Check (Sensor Heating Up)	• O2S ceramic temp < 715° C • And • Time after O2S heater on 35.0 s	• ECT at start > -10° C • Engine shutoff time > 120.0 s • During ECM keep alive time (key off) < 500.0 s	• 35.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0136 O2 Sensor Circuit Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Heater Coupling Check)	• Delta voltage one step at heater switching > 2.0 V • And • Number of heater coupling >= 6.0 times [-]	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • For time > 10.0 s • Heater not active • For time > 0.0 s	• 60.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0137 O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Short To Ground, Core Connection Signal Wires)	• Signal voltage < 0.06 V • For time > 3.0 s • And • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3 measurements) < 0.01 V	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time n.a. (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time n.a. (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • Fuel cut off not active • Catalyst purge not active	• 3.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0138 O2 Sensor Circuit High Voltage Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Out Of Range High (Short To Battery Plus)	• Signal voltage > 1.08 V • For time > 5.0 s	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • Lambda set value > 0.995 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0139 O2 Sensor Circuit Slow Response Bank 1 Sensor 2	Oxygen Sensors Rear (Binary LSF) Check Of Transient Time At Fuel Cut Off	• EWMA filtered transient time at fuel cut off > 0.6 s • O2 voltage between 201.0 – 401.0 mV • Number of checks (initial phase) >= 4.0 [-] • Number of checks (step function) >= 3.0 [-]	• Rich voltage (enable) >= 548.0 mV • Lean voltage n.a. • O2S rear ready • Rear O2 - sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131 070.0 Ω • Or • Trigger for step change: delta transient time > 0.3 s	• 4.5 s • Multiple	• 1 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P013A O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	• EWMA filtered max differential transient time at fuel cutoff >= 0.8 s • And • Number of checks >= 1.0 [-]	• Time of fuel cutoff <= 90.0 s • Time after last fuel cutoff >= 5.0 s • Rear O2S ready • Exhaust temp at sensor deviation between actual and expected lambda signal < 8 after time since fuel cutoff at first cylinder >= 2.0 s • Exhaust mass flow >= 12.0 kg/h • Exhaust mass flow dynamic within range -500.0 – 500.0 kg/h • Sensor voltage at start of measurement > 0.45 V • Target voltage end of measurement <= 0.15 V	• 10.0 s	• 1 DCY	– For CBTA: Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – For CBUA: Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0140 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Signal Line Open Circuit)	• Signal voltage 0.40 – 0.60 V • For time > 3.0 s • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3.0 measurements) >= 2.80 V	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded	• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Ground Line Open Circuit)	• Internal resistance > 40,000.0 Ω • And • Exhaust temperature > 670° C	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s (CBTA) • For time > 22.0 s (CBUA) • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • Or • Heater power >= 24.0% • For time > 18.0 s (CBTA) • For time > 8.8 s (CBUA) • General: • Dew point exceeded • Valid Ri-measurements > 10.0 times [-]	• 50.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0141 O2 Sensor Heater Circuit Bank 1 Sensor 2	Oxygen Sensors Heater Rear 2 - Point - LSF Out Of Range	• Heater resistance 1,200.0 – 32,400.0 Ω (CBTA) • Heater resistance 880.0 – 30,400.0 Ω (CBUA)	• Modeled exhaust gas temp. 200 – 680° C • Engine shut-off-time > 120.0 s • (During ECM keep alive-time after ignition off) < 500.0 s (CBTA) • (During ECM keep alive-time after ignition off) < 1,200.0 s (CBUA) • Number of checks 10.0 [-] • Fuel cut off not active • Heater commanded on	• 6.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0142 O2 Sensor Circuit Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Heater Coupling Check)	• Delta voltage one step at heater switching > 2.0 V • And • Number of heater coupling >= 6.0 times [-]	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • For time > 10.0 s • Heater not active • For time > 0.0 s	• 60.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0143 O2 Sensor Circuit Low Voltage Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Short To Ground, Core Connection Signal Wires)	• Signal voltage < 0.06 V • For time > 3.0 s • And • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3.0 measurements) < 0.01 [V]	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time n.a. • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time n.a. • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • Fuel cut off not active • Catalyst purge not active	• 3.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0144 O2 Sensor Circuit High Voltage Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Out Of Range High (Short To Battery Plus)	• Signal voltage > 1.08 V • For time > 5.0 s	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • Lambda set value > 0,995 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0145 O2 Sensor Circuit Slow Response Bank 1 Sensor 3	Oxygen Sensors Rear (Binary LSF) Check Of Transient Time At Fuel Cut Off	• EWMA filtered transient time at fuel cut off > 1.5 s • In voltage range 201.0 – 401.0 mV • Number of checks (initial phase) >= 4.0 [-] • Number of checks (step function) >= 3.0 [-]	• Rich voltage enable >= 548.0 mV • Lean voltage n.a. • O2S rear ready • Rear O2 - sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 - sensor internal resistance <= 131,070.0 Ω • Or • Trigger for step change: delta transient time > 0.3 s	• 4.5 s • Multiple	• 1 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0146 O2 Sensor Circuit No Activity Detected Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Signal Line Open Circuit)	• Signal voltage 0.40 – 0.60 V • For time > 3.0 s • And • Difference of sensor voltage with load pulse and voltage without load pulse (mean value of 3.0 measurements) >= 2.80 V	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded	• 5.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear 2 - Point - LSF O2S Signal Check - Circuit Continuity (Sensor Ground Line Open Circuit)	• Internal resistance > 40,000.0 Ω • And • Exhaust temperature > 670° C	• Case 1: sensor ready for operation • Sensor voltage <= 0.40 V • Or • Sensor voltage 0.50 – 1.08 V • Case 2: sensor theoretical ready for operation • For time > 12.0 s • Sensor sufficient heated up if exhaust temperature >= 1,263° C • For time > 18.0 s • Or • Heater power >= 24.0% • For time > 18.0 s • General: • Dew point exceeded • Valid Ri-measurements > 10.0 times [-]	• 50.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0147 O2 Sensor Heater Circuit Bank 1 Sensor 3	Oxygen Sensors Heater Rear 2 - Point - LSF Out Of Range	• Heater resistance 1,200.0 – 32,400.0 Ω	• Modeled exhaust gas temp. 200 – 680° C • Engine shut-off-time > 120.0 s • (During ECM keep alive-time after ignition off) < 500.0 s • Number of checks 10.0 [-] • Fuel cut off not active • Heater commanded on	• 6.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .
P0169 Incorrect Fuel Composition	ECM: EGAS Module Function Monitoring: Injection Time	• Comparison with fuel quantity incorrect	• Internal engine speed > 1,200 RPM	• 0.5 s • Continuous	• 2 DCY	– Check for contaminated/aged fuel or possible high concentration of alcohol in fuel (above 15%). Poor quality fuel will also increase consumption. Replace with fresh fuel if believed to be contaminated. Refer to appropriate repair manual. – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒
	ECM: EGAS Module Function Monitoring: Lambda Mode	• Internal check failed				
	ECM: EGAS Module Function Monitoring: Mixture Control	• Correction factor incorrect				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Fuel quantity incorrect				O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – If fuel quality is adequate, replace the Engine/ Motor Control Module. Refer to appropriate repair manual.
P0201 Cylinder 1 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0202 Cylinder 2 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0203 Cylinder 3 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0204 Cylinder 4 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0205 Cylinder 5 Injector "A" Circuit	Injection Valves Open Circuit	• Signal voltage 4.50 – 5.50 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0221 Throttle/Pedal Position Sensor/Switch "B" Circuit Range/Performance	Throttle Position Sensor 2 Rationality Check	• TPS1 - TPS2 > 6.30% • And • • Actual TPS2 - calc. value > actual TPS1 - calc. value • or • TPS2 - calc. value > 9.0%	• Engine speed > 480 RPM	• 0.3 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0222 Throttle/Pedal Position Sensor/Switch "B" Circuit Low	Throttle Position Sensor 2 Out Of Range Low	• Signal voltage < 0.20 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0223 Throttle/Pedal Position Sensor/Switch "B" Circuit High	Throttle Position Sensor 2 Out Of Range High	• Signal voltage > 4.81 V		• 0.1 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0261 Cylinder 1 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0262 Cylinder 1 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0264 Cylinder 2 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0265 Cylinder 2 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0267 Cylinder 3 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0268 Cylinder 3 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0270 Cylinder 4 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0271 Cylinder 4 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0273 Cylinder 5 Injector "A" Circuit Low	Injection Valves Short To Ground	• Signal voltage < 3.0 V	• Injection valve switched off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0274 Cylinder 5 Injector "A" Circuit High	Injection Valves Short To Battery Plus	• Signal current 2.20 – 4.0 A	• Injection valve switched on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 .
P0300 Random/Multiple Cyl-	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air).

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
inder Misfire Detected		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)	• Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 200 rev • Multiple	• Immediately	– Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						With Power Output Stage, Checking", page 696 .
P0301 Cylinder 1 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	Checking", page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0302 Cylinder 2 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle + 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking”, page 696 .
P0303 Cylinder 3 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking”, page 696 .
P0304 Cylinder 4 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm • IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling. – Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal com-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)		• 200 rev • Multiple	• Immediately	pression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0305 Cylinder 5 Misfire Detected	Misfire Crankshaft Speed Fluctuation (Single Or Multiple)	• Emission threshold misfire rate (MR) > 2.0%	• Active after engine start idle – 150 RPM + 1 camshaft rev • Engine speed range 500 – 6,400 RPM • Engine torque >= 0.0 Nm	• 1,000 rev • Multiple	• 2 DCY	– Check the intake system visually for leaks (false air). – Check the spark plugs visually for signs of fouling.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Catalyst damage misfire rate (MR) > 3.4 – 20.3% (CBTA) • Catalyst damage misfire rate (MR) > 3.4 – 20.0% (CBUA)	• IAT > - 48° C • ECT @ start > - 48° C • Fuel cutoff not active • Rough road not detected	• 200 rev • Multiple	• Immediately	– Check for an engine mechanical fault with a cylinder compression test. Carbon buildup may cause a higher than normal compression reading and may contribute to this concern. Refer to appropriate repair manual for low compression readings or for carbon buildup removal. – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 . – Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking”, page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0321 Ignition/ Distributor Engine Speed Input Circuit Range/ Performance	RPM Sensor Rationality Check	• Counted teeth vs. reference incorrect • Or • Monitoring reference gap failure		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 .
P0322 Ignition/ Distributor Engine Speed Input Circuit No Signal	RPM Sensor Signal Activity Check	• Camshaft signals > 5.0 [-] • And • Engine speed no signal		• 2.0 s • Multiple	• 2 DCY	– Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 . – Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0324 Knock/Combustion Vibration Control System Error	Knock Control Internal Hardware Check	• Signal fault counter (combustion) > 30.0 [-] • Or • Signal fault counter (measuring window) > 2.0 [-]	• Engine speed > 2,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 -G61-. Refer to ⇒ K3.6.16 nock Sensor 1 G61, Checking", page 700 . – Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking", page 702 .
P0327 Knock/Combustion Vibration Sensor 1 Circuit Low Bank 1 or Single Sensor	Knock Sensor Short To Ground Port A Knock Sensor Short To Ground Port B	• Lower threshold < - 0.70 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 -G61-. Refer to ⇒ K3.6.16 nock Sensor 1 G61, Checking", page 700 . – Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking", page 702 .
	Knock Sensor Signal Range Check	• Lower threshold < 1.4 – 5.6 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		
P0328 Knock/Combustion Vibration Sensor 1 Circuit High Bank 1 or Single Sensor	Knock Sensor Short To Battery Plus Port A Knock Sensor Short To Battery Plus Port B	• Upper threshold > 1.0 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 1 -G61-. Refer to ⇒ K3.6.16 nock Sensor 1 G61, Checking", page 700 . – Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking", page 702 .
	Knock Sensor Signal Range Check	• Upper threshold > 23.0 – 92.0 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0332 Knock/Combustion Vibration Sensor 2 Circuit Low Bank 2	Knock Sensor Short To Ground Port A	• Lower threshold < - 0.70 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking”, page 702 .
	Knock Sensor Short To Ground Port B					
	Knock Sensor Signal Range Check	• Lower threshold < 1.4 – 5.6 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		
P0333 Knock/Combustion Vibration Sensor 2 Circuit High Bank 2	Knock Sensor Short To Battery Plus Port A	• Upper threshold > 1.0 V	• Engine speed > 1,000 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Knock Sensor 2 -G66-. Refer to ⇒ K3.6.17 nock Sensor 2 G66, Checking”, page 702 .
	Knock Sensor Short To Battery Plus Port B					
	Knock Sensor Signal Range Check	• Upper threshold > 23.0 – 92.0 V	• Engine speed > 2,000 RPM • ECT > 41° C • Engine load > 30.0 – 33.8%	• 0.5 s • Multiple		
P0341 Camshaft Position Sensor "A" Circuit Range/Performance Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	• Signal pattern incorrect		• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking”, page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking”, page 686 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0342 Camshaft Position Sensor "A" Circuit Low Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	• Signal voltage permanently low • Crankshaft signal 8.0 [-]		• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 .
P0343 Camshaft Position Sensor "A" Circuit High Bank 1 or Single Sensor	Phase Sensor 1 Rationality Check	• Signal voltage permanently high • Crankshaft signal 8.0 [-]		• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Engine Speed Sensor -G28-. Refer to ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686 .
P0351 Ignition Coil "A" Primary Control Circuit/Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0352 Ignition Coil "B" Primary Control Circuit/Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0353 Ignition Coil "C" Primary Control Circuit/Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0354 Ignition Coil "D" Primary Control Circuit/Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P0355 Ignition Coil "E" Primary Control Circuit/Open	Ignition Coils Open Circuit	• Signal current -0.25 – -2.0 mA • Or • Internal check failed	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0410 AIR System "A"	Air System Check After SAI	• Deviation SAI pressure > 50.0 hPa	• Mass airflow 7.0 – 120.0 kg/h • Delta engine load -10.0 – 10.0%/rev • ECT 5 – 108° C • IAT 5 – 100° C • Altitude < 2,700.0 m • SAI pressure sensor ready	• 6.0 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 . – Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .
P0413 AIR System Switching Valve "A" Circuit Open	Air Valve Open Circuit	• Signal voltage 9.25 – 11.25 V	• Air valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve -N112-. Refer to ⇒ S3.6.26 econdary Air Injection Solenoid Valve N112, Checking", page 723 .
P0414 AIR System Switching Valve "A" Circuit Shorted	Air Valve Short To Ground	• Signal voltage < 6.0 V	• Air valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve -N112-. Refer to ⇒ S3.6.26 econdary Air Injection Solenoid Valve N112,

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Air Valve Short To Battery Plus	• Signal current 2.20 – 4.20 A	• Air valve commanded on • Engine speed > 80 RPM			Checking", page 723 .
P0418 AIR System Control "A" Circuit	Air Pump Relay Open Circuit	• Signal voltage 4.50 – 5.50 V	• Pump relay commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0420 Catalyst System Efficiency Below Threshold Bank 1	Catalyst System Measure Of OSC Compared To OSC Of Borderline Catalyst	• Measured OSC / OSC of borderline catalyst measured OSC (HC and NOx-correlated) < 1.0 [-]	• Time after engine start > 343.0 s • Or • Time after dew point > 343.0 s • Delta exhaust mass flow < 25.0 kg/h • Exhaust gas mass flow, lower range 25.0 – 130.0 kg/h (CBUA) • Exhaust gas mass flow, lower range 25.0 – 120.0 kg/h (CBTA) • Exhaust gas mass flow, upper range n.a. • Modeled exhaust gas temp. dynamic < 50 K • Modeled exhaust gas temp. in catalyst system, lower range 500 – 860° C (CBUA) • Modeled exhaust gas temp. in catalyst system, lower range 560 – 860° C (CBTA) • Modeled exhaust gas temp. in catalyst system, upper range n.a. • Minimum modeled exhaust gas temp. in catalyst system > 400° C • For time > 120.0 s • Filtered minimum modeled exhaust gas temp. in catalyst system > 450° C • Engine load 12.8 – 65.3% (CBUA) • Engine load 12.8 – 60.0% (CBTA)	• 40.0 s (CBUA) • 30.0 s (CBTA) • Once / DCY	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Three Way Catalytic Converter (TWC). Refer to ⇒ T3.6.27 hree Way Catalytic Converter (TWC), Checking", page 725 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
			• Evap purge loading not high • Engine speed 1,200 – 3,320 RPM • Range between lambda set value and lambda value < 0.02 [-] • Out of lambda range < 2.0 s • Lambda control closed loop • Lambda control not at min or max limit • Number of checks 3.0 [-] • O2S front ready • O2S rear ready • SAS not active • No misfire • O2S front response monitoring in current driving cycle ready			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0441 EVAP System Incorrect Purge Flow	EVAP System Functional Check	• Deviation lambda control < 9.0% • And • Deviation idle control < 40.0%	• Time after engine start n.a. • Engine speed idle • Engine speed deviation < 100 RPM • ECT > 60° C • Or • Substitute ECT > 80° C • IAT > 5° C • Altitude < 2,700.0 m • Lambda control closed loop	• 20.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks", page 7 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0442 EVAP System Leak Detected (Small Leak)	EVAP System Small Leak Pressure Check	• Time for pressure drop < 1.9 s	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Air temperature drop after engine start < 5 K • Intake manifold vacuum > -2,560.0 hPa • Altitude < 2,700.0 m • Vehicle speed >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Restart temperature difference > 52 K • Evap purge valve closed • LDP active • Deep down hill driving • Delta ambient pressure < 7.03 hPa • Or • Engine load not < 19.5 – 45.0% • And • Delta vehicle speed not > -1 km/h	• 180.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks", page 7 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0444 EVAP System Purge Control Valve "A" Circuit Open	EVAP Purge Valve Open Circuit	• Signal voltage > 4.40 – 5.40 V	• EVAP purge valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0455 EVAP System Leak Detected - Large Leak	EVAP System Large Leak Pressure Check	• Time for pressure drop < 0.95 s .	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Air temperature drop after engine start < 8 K • Intake manifold vacuum > -2,560.0 hPa • Altitude < 2,700.0 m • Vehicle speed >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Restart temperature difference > 52 K • Evap purge valve closed • LDP active • Deep down hill driving • Delta ambient pressure < 7.03 hPa • Or • Engine load not < 19.5 – 45.0% • And • Delta vehicle speed not >= -1 km/h	• 180.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks", page 7 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0456 EVAP System Leak Detected (Very Small Leak)	EVAP System Very Small Leak Pressure Check	• Time for pressure drop < 5.8 s	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Air temperature drop after engine start < 3 K • Intake manifold vacuum > -2,560.0 hPa • Altitude < 2,700.0 m • Vehicle speed 0 – 140 od. >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Restart temperature difference > 52 K • Evap purge valve closed • LDP active • Hill driving • Delta ambient pressure -8.0 – 2.0 hPa • Or • Engine load not < 19.5 – 45.0% • And • Delta vehicle speed not >= -1 km/h • Additional: • Vehicle acceleration < 3.80 m/s2 • Delta engine load < 767.98%/seg	• 180.0 s • Once / DCY	• 2 DCY	– Check the EVAP System for Leaks. Refer to ⇒ S2.2.4 ystem, Checking For Leaks”, page 7 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking”, page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)”, page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)”, page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0458 EVAP System Purge Control Valve "A" Circuit Low	EVAP Purge Valve Short To Ground	• Signal voltage < 2.15 – 3.25 V	• EVAP purge valve commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 .
P0459 EVAP System Purge Control Valve "A" Circuit High	EVAP Purge Valve Short To Battery Plus	• Signal current > 2.2 A	• EVAP purge valve commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0491 AIR System Insufficient Flow Bank 1	Air System Flow Check During Catalyst Heating	• SAI pressure measured with SAI pressure sensor vs. modeled < 50.0 – 72.0% • Or • Absolute deviation of raw pressure signal from filtered signal: mean value < 1.5 – 9.0 hPa	• Mass air flow 7.0 – 120.0 kg/h • Delta engine load -10.0 – 10.0%/rev • ECT 5 – 108° C • IAT 5 – 100° C • Altitude < 2,700.0 m • SAI pressure sensor ready	• 45.0 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 . – Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0496 EVAP System High Purge Flow	Evaporative Emission System Incorrect Purge Flow - Stuck open	• Actual EVAP pump current vs. difference from last reading > 1.0 [-]	• Minimum ignition angle efficiency 20.0% • Engine speed > 20 RPM • Engine speed Deviation < 100 RPM • Time after engine start > 600.0 s • ECT > 60° C • And • ECT at start < 60° C • AAT > 4 [-] • And • < 35° C • Altitude < 2,700.0 m • O2S front ready • EVAP purge valve commanded off	• 5.0 s	• 2 DCY	– Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .
P0501 Vehicle Speed Sensor "A" Circuit Range/Performance	Vehicle Speed Plausibility Check	• Vehicle speed < 6 km/h	• Engine speed > 2,800 RPM • Engine torque > 120.0 Nm • Vehicle speed sensor no fault	• 10.5 s • Multiple	• 2 DCY	– Check the vehicle speed signal. Refer to ⇒ V3.6.29 ehicle Speed Signal, Checking", page 729 . – Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0506 Idle Control System RPM - Lower Than Expected	Idle Controller Out Of Range Low	• Engine speed deviation < -100 RPM • And • RPM controller torque value >= calculated max value.	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT > -48 °C • IAT > -48 °C • Vehicle speed ready • Evap purge valve closed • External torque request not demanded • For manual transmission: • Engine load < 34.5%	• 7.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
P0507 Idle Control System RPM - Higher Than Expected	Idle Controller Out Of Range High	• Engine speed deviation > 100 RPM • And • RPM controller torque value <= calculated min. value • Or • RPM controller P-portion and I-portion < -20.0 Nm	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT > -48 °C • IAT > -48 °C • Vehicle speed ready • Evap purge valve closed • External torque request not demanded	• 7.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P050A Cold Start Idle Control System Performance	Cold Start Monitoring Idle Controller Out of Range Low	• Engine speed deviation < -100 RPM • And • RPM controller torque value >= calculated max. value	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT @ start < 143° C • IAT > -48° C • EVAP purge valve closed • External torque request not demanded • Catalyst heating active • For manual transmission: • Engine load < 34.5%	• 5.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
	Cold Start Monitoring Idle Controller Out of Range High	• Engine speed deviation > 100 RPM • RPM controller torque value <= calculated min. value • RPM controller P-portion and I-portion < -20.0 Nm	• Time after engine start > 0.0 s • Engine speed idle • Vehicle speed 0 km/h • Altitude < 2,700.0 m • ECT @ start < 143° C • IAT > -48° C • EVAP purge valve closed • External torque request not demanded • Catalyst heating active			

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P052A Cold Start "A" Camshaft Position Timing Over-Advanced Bank 1	Cold Start Monitoring VVT Actuator Intake Target Error	• Difference between target position vs. actual position > 10° CRK	• Time after engine start >= 10.0 s • Engine speed >= 400 RPM • Modeled oil temperature >= -48° C • Catalyst heating active	• 5.0 s • Once / DCY	• 2 DCY	– Check engine oil for incorrect viscosity or in need of servicing (dirty oil). Oil that is not clear in color may be causing the sensor to operate incorrectly. The engine oil must be clean and of the correct viscosity in order for the sensor to operate properly. Check the vehicle paperwork to determine what oil viscosity has been used and when the last oil change was performed. Change the engine oil if necessary. – Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 .
P0606 ECM/PCM Processor	Oxygen Sensors Heater Front Out Of Range	• Difference between measured calibration resistance in ECM and set value > 45.0 Ω	• Time after engine start > 40.0 s • Engine speed idle	• 40.0 s • Multiple	• 2 DCY	– Replace the Engine/ Motor Control Module -J623-. Refer to appropriate repair manual.
	Altitude Sensor Plausibility Check	• Signal gradient > 50.0 hPa		• 20.0 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Signal gradient < -50.0 hPa				
	Altitude Sensor Short To Ground	• Signal voltage < 0.20 V		• 0.2 s • Multiple		
	Altitude Sensor Short To Battery / Open Circuit	• Signal voltage > 4.88 V				
	ECM: WDA Function Monitoring: WDA	• General cause failure		• 0.5 s • Continuous		
		• Internal check failure				
		• Overvoltage detection failure				
	ECM: EEPROM Check	• Check failed				
	ECM: Self Check For Sensor IC internal Hardware Check (Electrical Adjustment Communication, Voltage Supply)	• Check				
	ECM: 5V Supply Voltage Internal Hardware Check	• Under-/ overvoltage detection				
	ECM: A/D Converter Power-Up Calibration	• Check failed	• Initialization phase active			
	ECM: A/D Converter Adc-Cannel Conversion		• Initialization phase active • Power-up calibration executed			
	ECM: EGAS Module Function Monitoring: A/D Converter	• Comparison reference voltage with sensor voltage incorrect				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Test voltage check failed				
		• Internal check failed				
	ECM: EGAS Module Function Monitoring: Torque	• Comparison with allowed engine torque incorrect	• Internal engine speed > 600 RPM			
	ECM: EGAS Module Function Monitoring: Engine Speed Deviation	• Difference between calculated and internal engine speed > 320 RPM	• Internal engine speed > 520 RPM			
	ECM: EGAS Module Function Monitoring: Coding	• Internal check failed				
	ECM: EGAS Module Function Monitoring: Ignition Timing					
	ECM: EGAS Module Function Monitoring: Intern	• System reaction incorrect				
	ECM: EGAS Module Function Monitoring: Injection Rate Limitation					
	ECM: EGAS Module Function Monitoring: Accelerator Position	• Internal check failed				

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	ECM: EGAS Module Monitoring Module	• Function controller check failed • And • Monitoring module check no failure	• SPI - interface no failure			
	CAN: Internal Fault CAN Controller RAM Check	• RAM error memory checksum error	• Initialization phase • Time after ignition on 500.0 ms	• 0.0 ms • Once / DCY		
P0627 Fuel Pump "A" Control Circuit/Open	Fuel Pump Relay Open Circuit	• Signal voltage 4.50 – 5.50 V	• Pump relay commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 .
	Fuel Pump Relay Short To Ground	• Signal voltage < 3.0 V				
P0629 Fuel Pump "A" Control Circuit High	Fuel Pump Relay Short To Battery Plus	• Signal current 0.60 – 1.20 A	• Pump relay commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Fuel Delivery Unit - GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0638 Throttle Actuator Control Range/ Performance Bank 1	Throttle Actuator Basic Settings Rationality Check Close Movement	• Time to close to reference point > 0.6 s • And • Reference point 2.88%	• Engine speed 0 RPM • Vehicle speed 0 km/h • ECT > -20° C • IAT > -20° C • Case 1: • Ignition on • Case 2: • Engine shut-off-time 3.0 s • Number of checks 2.0 [-]	• 5.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
	Throttle Actuator Basic Settings Signal Range Check @ Mechanical Stop Low	• TPS 1 signal voltage not (0.40 – 0.80) V • Or • TPS 2 signal voltage not (4.20 – 4.60) V • Or • TPS1 + TPS2 not (4.82 – 5.18) V	• Engine speed 0 RPM • Vehicle speed 0 km/h • Case 1: • Ignition on • ECT -20 – 115° C • IAT -20 – 143° C • Case 2: • Engine shut-off-time 3.0 s • ECT 5 – 115° C • IAT 5 – 143° C	• 0.3 s • Multiple		
P0641 Sensor Reference Voltage "A" Circuit/ Open	ECM: Sensor Reference Circuit A Signal Range Check	• Signal voltage deviation > +/- 0.3 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/ Motor Control Module -J623-. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P0651 Sensor Reference Voltage "B" Circuit/Open	ECM: Sensor Reference Circuit B Signal Range Check	• Signal voltage deviation > +/- 0.3 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/ Motor Control Module -J623-. Refer to appropriate repair manual.
P0697 Sensor Reference Voltage "C" Circuit/Open	ECM: Sensor Reference Circuit C Signal Range Check	• Signal voltage deviation > +/- 0.3 V		• 0.5 s • Continuous	• 2 DCY	– If a related sensor voltage code is also set, refer to that sensor for diagnosis first. If no other related codes set, replace the Engine/ Motor Control Module -J623-. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P117A Bank 1, Oxygen Sensor Correction Center Sensor Control Limit Reached	Fuel System Out Of Range	• I - portion of 3rd lambda control loop > 0.03 [-]	• Engine speed 1,400 – 3,600 RPM • Modeled exhaust gas temp 350 – 1,000° C • Engine load 20.3 – 54.8% • Lambda control closed loop • 2nd lambda control closed loop • 3rd lambda control closed loop • O2S rear ready • Electrical check ready • O2S heater rear ready no fault	• 1,800.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 . – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .
P150A Engine Off Timer Performance	Engine-Off-Time Comparison Of Engine Off Time From Instrument Cluster Control Unit With Engine After Run Time	• Difference between engine-off-time and ECM after-run time < -12.0 s	• Key on after ECM after run time active • CAN active	• 6.0 s • Once / DCY	• 2 DCY	– If ignition off B+ is lost to ECM, this code will set. Check power and ground inputs to ECM first. Refer to Wiring Diagrams for pin locations. If all power/grounds to ECM are

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Difference between engine-off-time and ECM after-run time > 12.0 s	• Key on during ECM after run time active • CAN active			present, replace the Engine/ Motor Control Module -J623-. Refer to appropriate repair manual.
P2088 "A" Camshaft Position Actuator Control Circuit Low Bank 1	VVT Actuator Intake Short To Ground	• Signal voltage < 2.15 – 3.25 V	• Camshaft valve off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 .
P2089 "A" Camshaft Position Actuator Control Circuit High Bank 1	VVT Actuator Intake Short To Battery Plus	• Signal current > 2.2 A	• Camshaft valve on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Camshaft Position Sensor -G40-. Refer to ⇒ C3.6.3 amshaft Position Sensor G40, Checking", page 674 . – Check the Camshaft Adjustment Valve 1 -N205-. Refer to ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking", page 672 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2096 Post Catalyst Fuel Trim System Too Lean Bank 1	Fuel System Out Of Range	• I-portion of 2nd lambda control loop < -0.040 [-] (CBTA) • I-portion of 2nd lambda control loop < -0.030 [-] (CBUA)	• Modeled exhaust gas temp. 400 – 1,000° C • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • Lambda control not at min or max limit • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front active • O2S heater rear active • Fuel cut off not active • Catalyst heating not active • SAI not active	• 140.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2097 Post Catalyst Fuel Trim System Too Rich Bank 1	Fuel System Out Of Range	• I-portion of 2nd lambda control loop > 0.040 [-] (CBTA) • I-portion of 2nd lambda control loop > 0.030 [-] (CBUA)	• Modeled exhaust gas temp. 400 – 1,000° C • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • Lambda control not at min or max limit • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front active • O2S heater rear active • Fuel cut off not active • Catalyst heating not active • SAI not active	• 140.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Oxygen Sensor 1 After Catalytic Converter - GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 . – Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .
P2101 Throttle Actuator "A" Control Motor Circuit Range/	Throttle Actuator Rationality Check	• Deviation throttle value angles vs calculated value > 4.0 – 50.0%		• 0.5 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module - GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
Performance	Throttle Actuator Signal Range Check	• Duty cycle > 80.0% • And • ECM power stage no failure		• 5.0 s • Multiple		
P2106 Throttle Actuator Control System - Forced Limited Power	Throttle Actuator Open Circuit	• Internal check	• Duty cycle > 80.0% • Or • Deviation throttle value angle vs. calculated value > 4.0 – 50.0%	• 12.0 s • Multiple	• 2 DCY	– Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 .
	Throttle Actuator Functional Check	• Internal check failed				
	Throttle Actuator Temperature / Current Monitoring					
	Throttle Actuator Short To Battery Plus / Short To Ground	• Internal check				
P2122 Throttle/Pedal Position Sensor/Switch "D" Circuit Low	Accelerator Position Sensor 1 Out Of Range Low	• Signal voltage < 0.6 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .
P2123 Throttle/Pedal Position Sensor/Switch "D" Circuit High	Accelerator Position Sensor 1 Out Of Range High	• Signal voltage > 4.8 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2127 Throttle/ Pedal Position Sensor/ Switch "E" Circuit Low	Accelerator Position Sensor 2 Out Of Range Low	• Signal voltage < 0.3 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .
P2128 Throttle/ Pedal Position Sensor/ Switch "E" Circuit High	Accelerator Position Sensor 2 Out Of Range High	• Signal voltage > 2.4 V		• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .
P2138 Throttle/ Pedal Position Sensor/ Switch "D"/"E" Voltage Correlation	Accelerator Position Sensor 1 And 2 Rationality Check	• Signal voltage sensor 1 vs. 2 > 0.167 – 0.703 V	• Signal voltage sensor 1 > 445.0 mV • Signal voltage sensor 2 > 445.0 mV	• 0.5 s • Continuous	• 2 DCY	– Check the Accelerator Pedal Module -GX2-. Refer to ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking", page 670 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2177 System Too Lean Off Idle Bank 1	Fuel System Too Lean @ Part Load	• Adaptive value > 28.0%	• Time after engine start n.a. • Engine speed 1,320 – 4,600 RPM • Engine load 25.0 – 46.0% • Mass air flow 45.0 – 300.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Lambda control closed loop • Evap purge valve closed • If low fuel signal then wait until fuel consumption n.a.	• 25.0 s • Multiple	• 2 DCY	– Check the vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking”, page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2178 System Too Rich Off Idle Bank 1	Fuel System Too Rich @ Part Load	• Adaptive value < -28.0%	• Time after engine start n.a. • Engine speed 1,320 – 4,600 RPM • Engine load 25.0 – 46.0% • Mass air flow 45.0 – 300.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Lambda control closed loop • Evap purge valve closed	• 25.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 . – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking”, page 716 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking”, page 690 . – Check the Intake Manifold Sensor - GX9-. Refer to ⇒ I3.6.15 ntake

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						Manifold Sensor GX9, Checking”, page 698 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking”, page 688 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2181 Cooling System Performance	Coolant System Performance Cooling System Performance Not In A Expect Range	• Thers_03: • Cooling system temperature to low after a sufficient air mass flow integral 75° C	• Thres_01: • Begin of air mass integration when engine temp. 30° C • Thers_02: • ECT @ start -10 – 60° C • AAT > -10° C • Fuel cut off not active • And • Engine load 14.0 – 95.0% • Air mass_01: • Integrated air mass depending on engine temp. at start and AAT 4.0 – 13.5 kg/h (CBTA) • Integrated air mass depending on engine temp. at start and AAT 4.0 – 13.47 kg/h (CBUA) • Depending on temp. at engine start and min. observed AAT for longer than 120.0 – 180.0 s • Depending on temp. at engine start and min. observed AAT for more than 4.0 – 12.0 kg • At time of fault decision: • Average air mass flow 35.0 – 280.0 kg/h • Average vehicle speed 30 – 120 km/h	• 2.0 s • Once / DCY	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 . – Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 . – Check the engine coolant thermostat. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2184 Engine Coolant Temperature Sensor 2 Circuit Low	Fan Control Coolant Temperature Sensor Short To Ground	• ECT outlet > 140° C		• 2.0 s • Continuous	• 2 DCY	– Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .
P2185 Engine Coolant Temperature Sensor 2 Circuit High	Fan Control Coolant Temperature Sensor Short To Battery / Open Circuit	• ECT outlet < -40° C		• 2.0 s • Continuous	• 2 DCY	– Check the Engine Coolant Temperature Sensor on Radiator Outlet -G83-. Refer to ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2187 System Too Lean at Idle Bank 1	Fuel System Too Lean @ Idle	• Adaptive value > 5.02%	• Time after engine start n.a. • Engine speed < 860 RPM • Mass air flow < 35.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Delta part load adaptation ready • Lambda control closed loop • Evap purge valve closed • If low fuel signal then wait until fuel consumption n.a.	• 40.0 s • Multiple	• 2 DCY	– Check the vacuum lines visually for leaks. – Check the intake system visually for leaks (false air). – Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck”, page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking”, page 694 – Check the Oxygen Sensor 1 Before Catalytic Converter - GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking”, page 716 . – Check the Fuel Delivery Unit - GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2188 System Too Rich at Idle Bank 1	Fuel System Too Rich @ Idle	• Adaptive value < -5.02%	• Time after engine start n.a. • Engine speed < 860 RPM • Mass air flow < 35.0 kg/h • ECT > 59° C • Or • Substitute ECT n.a. • IAT < 85° C • Ratio manifold pressure to ambient pressure > 0.20 [-] • Or • Valve overlap < 40° CRK • Delta part load adaptation ready • Lambda control closed loop • Evap purge valve closed • If low fuel signal then wait until fuel consumption n.a.	• 40.0 s • Multiple	• 2 DCY	– Check the fuel pressure and delivery quantity. Refer to fuel system mechanical testing in ⇒ C3.1 heck", page 14 and/or to appropriate repair manual. – Check the Fuel Injectors. Refer to ⇒ F3.6.13 uel Injectors, Checking", page 694 . – Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						Manifold Sensor GX9, Checking", page 698 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2195 O2 Sensor Signal Biased/Stuck Lean Bank 1 Sensor 1	Oxygen Sensors Front Out Of Range	• Delta lambda of 2nd lambda control loop > 0.065 [-] (CBTA) • Delta lambda of 2nd lambda control loop > 0.070 [-] (CBUA)	• Modeled exhaust gas temp 400 – 1,000° C • Delta engine load < 12.0% • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front ready • O2S heater rear ready • Fuel cut off not active • Catalyst heating not active • SAI not active • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V	• 100.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2196 O2 Sensor Signal Biased/Stuck Rich Bank 1 Sensor 1	Oxygen Sensors Front Out Of Range	• Delta lambda of 2nd lambda control loop < -0.065 [-] (CBTA) • Delta lambda of 2nd lambda control loop < -0.070 [-] (CBUA)	• Modeled exhaust gas temp 400 – 1,000° C • Delta engine load < 12.0% • Exhaust gas mass flow 18.0 – 180.0 kg/h • Lambda control closed loop • 2nd lambda control closed loop • O2S front ready • O2S rear ready • O2S heater front ready • O2S heater rear ready • Fuel cut off not active • Catalyst heating not active • SAI not active • Case 1: • 1st lambda control loop not at min or max limit • 2nd lambda control loop active • Case 2: • 1st lambda control loop at min limit • O2S front < 1.0 [-] • O2S rear voltage < 0.4 V • Case 3: • 1st lambda control loop at max limit • O2S front > 1.0 [-] • O2S rear voltage > 0.6 V	• 100.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 . – Check the Fuel Delivery Unit -GX1- / Fuel Pump Relay -J17-. Refer to ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690 . – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2237 O2 Sensor Positive Current Control Circuit/Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Pump Current (IP)	• O2S signal front < 1.70 V • And • Fuel cutoff > 3.0 s	• O2S ceramic temp > 720° C • Electrical adjustment not active • Heater control closed loop • Evap purge valve ready	• 5.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
		• O2S signal front 1.49 – 1.51 V • And • Delta lambda controller > 0.10 [-]	• O2S ceramic temp > 720° C • Lambda modulation > 0.02 [-] • Lambda control closed loop • Heater control closed loop	• 6.5 s • Multiple		
P2243 O2 Sensor Reference Voltage Circuit/Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Nernst Voltage (UN)	• O2S signal front > 4.70 V • And • Internal resistance > 950.0 Ω	• Heater control active	• 25.5 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
		• O2S signal front < 0.20 V • And • Internal resistance > 950.0 Ω				
P2251 O2 Sensor Negative Current Control Circuit/Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Virtual Mass (VM)	• O2S signal front 1.47 – 1.53 V • And • Internal resistance > 950.0 Ω	• Modeled exhaust gas temp < 750 Ω • No fuel cutoff > 2.0 s • Heater control active	• 30.5 s	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2257 AIR System Control "A" Circuit Low	Air Pump Relay Short To Ground	• Signal voltage < 3.0 V	• Pump relay commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .
P2258 AIR System Control "A" Circuit High	Air Pump Relay Short To Battery Plus	• Signal current 0.60 – 1.20 A	• Pump relay commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .
P2270 O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF Stuck Lean (If Sensor Stuck Lean: 30.0% Enrichment) (CBTA)	• O2S signal rear not oscillating at reference < 600.0 mV	• Mass air flow 22.0 – 120.0 kg/h (CBTA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 30.0 s (CBTA) • 2nd lambda control closed loop	• 210.0 s (CBTA) • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear 2 - Point - LSF Stuck Lean (If Sensor Stuck Lean: 20.0 - 30.0% Closed Loop Enrichment) (CBUA)		• Mass air flow 30.0 – 120.0 kg/h (CBUA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 10.0 s (CBUA) • 2nd lambda control closed loop	• 80.0 s (CBUA) • Multiple		– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .
P2271 O2 Sensor Signal Biased/Stuck Rich Bank 1 Sensor 2	Oxygen Sensors Rear 2 - Point - LSF Stuck Rich (If Sensor Stuck Rich: 7.0% Enleanment) If Enleanment Is Not Successful: Waiting For Next Fuel Cut Off (CBTA)	(CBTA) • O2S signal rear not oscillating at reference > 600.0 mV	(CBTA) • Mass air flow 22.0 – 120.0 kg/h (CBTA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 30.0 s (CBTA) • Fuel cut off > 3.0 s • 2nd lambda control closed loop	• 210.0 s (CBTA) • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear (Binary Check Of Response Time At Fuel Cut Off (CBTA)	(CBTA) • Response time at fuel cut off > 6.0 s • And • Measurement range from fuel cut off to voltage threshold <= 191.0 mV • And • Number of checks (initial phase) >= 1.0 [-] • Or • Measurement range from fuel cut off to O2 mass flow threshold >= 7,000.0 mg • And • Number of checks (initial phase) >= 1.0 [-]	(CBTA) • Rich voltage (enable) >= 548.0V • Lean voltage <= 191.0V • O2S rear ready • Rear O2-sensor signal oscillating • Monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2-Sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131,070.0 Ω	• 6.0 s (CBTA) • Multiple		
	Oxygen Sensors Rear 2 - Point - LSF Stuck Rich (If Sensor Stuck Rich: 7.0% - 15.0% Closed Loop Enleanment) If Enleanment Is Not Successful: Waiting For Next Fuel Cut Off (CBUA)	(CBUA) • O2S signal rear not oscillating at reference > 600.0 mV	(CBUA) • Mass air flow 30.0 – 120.0 kg/h (CBUA) • Modeled exhaust gas temp > 350° C • O2S rear readiness > 10.0 s (CBUA) • Fuel cut off > 3.0 s • 2nd lambda control closed loop	• 80.0 s (CBUA) • Multiple		– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
	Oxygen Sensors Rear (Binary LSF) Check Of Response Time At Fuel Cut Off (CBUA)	(CBUA) • Response time at fuel cut off > 6.0 s • And • Measurement range from fuel cut off to voltage threshold <= 191.0 mV • And • Number of checks (initial phase) >= 1.0 [-] • Or • Measurement range from fuel cut off to O2 mass flow threshold >= 4,000.0 mg • And • Number of checks (initial phase) >= 1.0 [-]	(CBUA) • Rich voltage (enable) >= 548.0V • Lean voltage n.a. • O2S rear ready • Rear O2-sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131,070.0 Ω	• 4.5 s (CBUA) • Multiple		
P2274 O2 Sensor Signal Biased/Stuck Lean Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF Stuck Lean (If Sensor Stuck Lean: 30.0% Enrichment)	• O2S signal rear not oscillating at reference < 600.0 mV	• Mass air flow 22.0 – 120.0 kg/h • Modeled exhaust gas temp. > 350° C • O2S rear readiness > 30.0 s • 2nd lambda control closed loop	• 210.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2275 O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 3	Oxygen Sensors Rear 2 - Point - LSF Stuck Rich (If Sensor Stuck Rich: 7.0% Enleanment) If Enleanment Is Not Successful: Waiting For Next Fuel Cut Off	• O2S signal rear not oscillating at reference > 600.0 mV	• Mass air flow 22.0 – 120.0 kg/h • Modeled exhaust gas temp. > 350° C • O2S rear readiness > 30.0 s • Fuel cut off active • 2nd lambda control closed loop	• 210.0 s • Multiple	• 2 DCY	– Check the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680 .
	Oxygen Sensors Rear (Binary LSF) Check Of Response Time At Fuel Cut Off	• Response time at fuel cut off > 6.0 s • And • Measurement range from fuel cut off to voltage threshold <= 191.0 mV • And • Number of checks (initial phase) >= 1.0 [-] • Or • Measurement range from fuel cut off to O2 mass flow threshold >= 7,000.0 mg • And • Number of checks (initial phase) >= 1.0 [-]	• Rich voltage (enable) >= 548.0V • Lean voltage n.a. • O2S rear ready • Rear O2 - sensor signal oscillating monitoring ready • EVAP purge valve diagnosis ready • O2S front ready • Fuel cut off active • Front O2 - sensor lambda signal > 4.0 [-] • Modeled exhaust gas temp. > 480° C • Slope of exhaust mass < 50.0 kg/h • Rear O2 sensor internal resistance <= 131,070.0 Ω	• 4.5 s • Multiple		

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2279 MAP /MAF - Throttle Position Correlation	Leak to Intake Manifold Adaptation Value Monitoring	• Offset value throttle mass flow > 13.0 kg/h	• Desired mass flow 0.0 – 25.0 kg/h • EVAP purge valve closed • EGR off	• 10.0 s • Multiple	• 2 DCY	• Check for air leaks near the throttle body, oil fill cap not tight or oil dipstick not seated in tube. Also check for any engine gaskets that can cause additional air to enter the crankcase can set this fault as the PCV system is not metered. If a vacuum leak or crankcase seal is the cause, the idle may be rough or unstable. – Check the Intake Manifold Sensor -GX9-. Refer to ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698 . – Check the Throttle Valve Control Module -GX3 / J338-. Refer to ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726 . – Check the EVAP Canister Purge Regulator Valve 1 -N80-. Refer to ⇒ E3.6.10 VAP Canister Purge Regu-

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
						lator Valve 1 N80, Checking", page 688 .
P2300 Ignition Coil "A" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2301 Ignition Coil "A" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2303 Ignition Coil "B" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2304 Ignition Coil "B" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2306 Ignition Coil "C" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2307 Ignition Coil "C" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2309 Ignition Coil "D" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2310 Ignition Coil "D" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2312 Ignition Coil "E" Primary Control Circuit Low	Ignition Coils Short To Ground	• Signal current > 24.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2313 Ignition Coil "E" Primary Control Circuit High	Ignition Coils Short To Battery Plus	• Signal voltage > 5.1 – 7.0 mA	• Engine speed > 680 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Ignition Coils with Power Output Stage. Refer to ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696 .
P2400 EVAP System Leak Detection Pump Control Circuit/Open	LDP Open Circuit	• Signal voltage > 4.40 – 5.60 V	• LDP commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2401 EVAP System Leak Detection Pump Control Circuit Low	LDP Short To Ground	• Signal voltage < 2.15 – 3.25 V	• LDP commanded off • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .
P2402 EVAP System Leak Detection Pump Control Circuit High	LDP Short To Battery Plus	• Signal current > 3.0 A	• LDP commanded on • Engine speed > 80 RPM	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2403 EVAP System Leak Detection Pump Sense Circuit/ Open	Reed Sensor Rationality Check Unable To Close	• Low signal voltage > 0.5 s	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Altitude < 2,700.0 m • Integrated purge flow > 29.90 g • Restart temperature difference > 52 K • Vehicle speed >= 0 km/h • Vehicle speed ones > 30 km/h • Selected gear any drive • Evap purge valve ready • LDP commanded off	• 0.5 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .
P2404 EVAP System Leak Detection Pump Sense Circuit Range/ Performance	Reed Sensor Rationality Check Unable To Open	• High signal voltage > 12.0 s • And • Number of checks 30.0 [-]	• Time after engine start 12.0 – 1,200.0 s • Preceding engine shut-off time > 21,600.0 s • ECT 5 – 105° C • ECT @ start 5 – 105° C • Air temperature 5 – 95° C • Altitude < 2,700.0 m • Intake manifold vacuum > -2,560.0 hPa • Restart temperature difference > 52 K • Vehicle speed >= 0 km/h	• 12.0 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 . – Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
		• Cumulative time of high signal voltage during pumping > 10.0 s	• Vehicle speed ones > 30 km/h • Selected gear any drive • Evap purge valve closed, ready • LDP commanded on	• 120.0 s • Once / DCY		
P240A EVAP System Leak Detection Pump Heater Control Circuit/Open	EVAP Leak Detection Pump Open Circuit	• Signal voltage > 4.7 – 5.4 V	• Evap pump heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump - V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 , as applicable.
P240B EVAP System Leak Detection Pump Heater Control Circuit Low	EVAP Leak Detection Pump Short To Ground	• Signal voltage < 2.74 – 3.26 V	• Evap pump heater commanded off	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump - V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 , as applicable.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P240C EVAP System Leak Detection Pump Heater Control Circuit High	EVAP Leak Detection Pump Short To Battery Plus	• Signal current > 2.2 – 4.0 A	• Evap pump heater commanded on	• 0.5 s • Continuous	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 , as applicable.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2407 EVAP System Leak Detection Pump Sense Circuit Intermittent/Erratic	EVAP Leak Detection Pump Signal Check During Engine Off	• Fluctuation of evap pump current during reference measurement > 1 mA • Or • Drop of evap pump current during pump phase > 6 mA • For time >= 3.0 s	• Engine temperature @ engine start >= 4° C • Difference between ECT and IAT @ engine start <= 15 K • Ambient air temperature < 35; > 4° C • Altitude <= 2700 m • Time since engine start in preceding dcy >= 600.0 s • Change in battery voltage during monitoring < 1.0 V • Engine off time >= 5.0 s • Vehicle speed 0 km/h • Evap purge adaptation < 5.0 [-] • Deviation of filtered evap pump current during reference measurement within range <= 1 mA • Change in relative evap pump current during monitoring n.a. • Within time n.a. • (During ECM keep alive-time after ignition off, max. time) < 900.0 s • Airbag not activated • (After MIL illumination because of any EVAP leakage the monitor is only activated every) 1 dcys	• 800.0 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)”, page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)”, page 706 , as applicable.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2414 O2 Sensor Exhaust Sample Error Bank 1 Sensor 1	Oxygen Sensors Front Signal Range Check (Check For Sensor At Ambient Air)	• Threshold 1: • Signal voltage 3.10 – 4.77 V • Threshold 2: • Signal voltage 2.50 – 3.06 V • Depending on gain factor that actual is used for sensor	• Lambda value < 1.6 [-] • O2S ceramic temp. > 715° C • Fuel cut off not active • Heater control closed loop • SAI not active • If low fuel signal then wait > 0.0 s	• 15.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
P2431 AIR System Air Flow/Pressure Sensor Circuit Range/Performance Bank 1	Air System Pressure Sensor Rationality Check	• Difference between SAI pressure and ambient pressure not (-60.0 – 60.0_ hPa	• SAI done	• 0.5 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 .
P2432 AIR System Air Flow/Pressure Sensor Circuit Low Bank 1	Air System Pressure Sensor Signal Range Check	• Signal voltage < 0.5 V		• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2433 AIR System Air Flow/ Pressure Sensor Circuit High Bank 1	Air System Pressure Sensor Signal Range Check	• Signal voltage > 4.5 V		• 0.5 s • Continuous	• 2 DCY	– Check the Secondary Air Injection Sensor 1 -G609-. Refer to ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721 .
P2440 AIR System Switching Valve Stuck Open Bank 1	Air System Check After SAI	• SAI pressure measured with SAI pressure sensor vs. modeled while SAI valve closed < 65.0%	• ECT 5 – 108° C • IAT 5 – 100° C • Altitude < 2,700.0 m • SAI pressure sensor ready	• 45.0 s • Once / DCY	• 2 DCY	– Check the Secondary Air Injection Solenoid Valve -N112-. Refer to ⇒ S3.6.26 econdary Air Injection Solenoid Valve N112, Checking", page 723 . – Check the Secondary Air Injection Pump Relay -J299- / Secondary Air Injection Pump Motor -V101-. Refer to ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
P2450 EVAP System Switching Valve Performance/Stuck Open	EVAP Leak Detection Pump Rationality Check During Engine Off	• Evap pump current difference between reference measurement to idle <= 3 mA	• Engine temperature @ engine start >= 4° C • Difference between ECT and IAT @ engine start <= 15 K • Ambient air temperature < 35; > 4° C • Altitude <= 2,700 m • Time since engine start in preceding dcy >= 600.0 s • Change in battery voltage during monitoring < 1.0 V • Engine off time >= 5.0 s • Vehicle speed 0 km/h • Evap purge adaptation < 5.0 [-] • No sudden change in evap pump current (filling event) < 2; > -1 mA • Deviation of filtered evap pump current during reference measurement within range <= 1.0 mA • Change in relative evap pump current during monitoring n.a. • Within time n.a. • (During ECM keep alive-time after ignition off, max. time) < 900.0 s • Airbag not activated • (After MIL illumination because of any EVAP leakage the mon-	• 13.5 s • Once / DCY	• 2 DCY	– Check the Leak Detection Pump -V144-. Refer to ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704 , or ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706 , as applicable.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
			itor is only activated every) 1 dcys			
P2626 O2 Sensor Pumping Current Trim Circuit/ Open Bank 1 Sensor 1	Oxygen Sensors Front Open Circuit Adjustment Voltage (IA)	• O2S signal front > 4.77 V	• Modeled exhaust temp. < 750° C • O2S ceramic temp. > 720° C • Fuel cut off active • Heater control closed loop • If low fuel signal then wait > 0.0 s	• 2.0 s • Multiple	• 2 DCY	– Check the Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716 .
P3081 Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	Engine Coolant Temperature Sensor Rationality Measured Engine Coolant Temp. Below Reference Model	• Range_01: • Measured engine coolant temp. not within in a range of the reference model > 11 K	• Modmax_01: • Maximum reference temperature 60° C	• 4.0 s • Multiple	• 2 DCY	– Check the Engine Coolant Temperature Sensor -G62-. Refer to ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683 .
U0001 High Speed CAN Communication Bus	CAN: CAN-Bus Reading Back Sent Message (Powertrain)	• CAN message no feedback	• Time after ignition on 500.0 ms	• 250.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
U0002 High Speed CAN Communication Bus Performance	CAN: CAN-Bus CAN Communication Check (Powertrain)	• Global time out receiving no message	• Time after ignition on 500.0 ms	• 450.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .
U0101 Lost Communication with TCM	CAN: TCM CAN Communication With TCM	• Received CAN message no message	• Time after ignition on 500.0 ms	• 500.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance between the Transmission Control Module to the Engine/ Motor Control Module -J623-. Refer to ⇒ C3.6.5 AN-Bus Terminal Resistance, Powertrain, Checking", page 678 .
U0121 Lost Communication With Anti-Lock Brake System (ABS) Control Module "A"	CAN: Brake Unit CAN Communication With Brake Unit	• Received CAN message no message	• Time after ignition on 500.0 ms	• 440.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
U0146 Lost Communication With Gateway "A"	CAN: Gateway CAN Communication With Gateway	• Received CAN message no message	• Time after ignition on 500.0 ms	• 1,000.0 ms • Continuous	• 2 DCY	Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .
U0155 Lost Communication With Instrument Panel Cluster (IPC) Control Module	CAN: Instrument Cluster CAN Communication With Instrument Cluster Module	• Received CAN message no message	• Time after ignition on 500.0 ms	• 500.0 ms • Continuous	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .
U0302 Software Incompatibility With Transmission Control Module	CAN: TCM CAN Communication With TCM	• Received AT vehicle data TCM signal	• Time after ignition on 500.0 ms	• 100.0 ms • Continuous	• 2 DCY	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Transmission Control Module. Refer to appropriate repair manual.
U0402 Invalid Data Received From TCM	CAN: TCM CAN Communication With TCM	• Received data implausible message	• Time after ignition on 500.0 ms	• 60.0 ms • Continuous	• 2 DCY	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Transmission Control Module. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
U0415 Invalid Data Received From Anti-Lock Brake System (ABS) Control Module "A"	CAN: Vehicle Speed Sensor CAN Communication With Vehicle Speed Sensor	• Speed sensor signal: initialization error 327.08 km/h		• 1,980.0 ms	• 2 DCY	– Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking”, page 676 . – Check the vehicle speed signal. Refer to ⇒ V3.6.29 ehicle Speed Signal, Checking”, page 729 .
		• Speed sensor signal: low voltage error 327.25 km/h				
		• Speed sensor signal: sensor error 327.42 km/h		• 480.0 ms • Continuous		
		• Vehicle speed >= 325 km/h		• 2,100.0 ms • Continuous		
		• Speed sensor signal: out of range 326.39 km/h		• 480.0 ms • Continuous		
	CAN: Brake Unit CAN Communication With Brake Unit	• Received data implausible message	• Time after ignition on 500.0 ms	• 60.0 ms • Continuous		
U0422 Invalid Data Received From Body Control Module	CAN: Ambient Air Temperature Sensor Communication With Instrument Cluster Module	• Ambient temperature value (initialization) 0.0 h [-]	• Key on • Status ambient temperature from instrument cluster no fault • Electrical check ambient temperature sensor no fault	• 3.0 s • Multiple	• 2 DCY	– Check for software updates and TSB's. Reprogram as necessary. If none are found, replace the Body Control Module. Refer to appropriate repair manual.
U0423 Invalid Data Received From Instrument Panel Cluster Con-	CAN: Instrument Cluster CAN Communication With Instrument Cluster Module	• Received CAN message implausible message	• Time after ignition on 500.0 ms	• 600.0 ms • Continuous	• 2 DCY	– Check for correct software version and VIN or update software for the IPC Module if available. If OK, replace the Instrument Cluster Control Module -J285-. Refer to appropriate repair manual.

DTC / Description	Monitor Strategy Description	Malfunction Criteria and Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Length Time	MIL Illumination	Component Diagnostic Procedure
trol Module	CAN: Ambient Air Temperature Sensor Communication With Instrument Cluster Module (CBTA)	• Ambient temperature value (initialization) 0.0 h [-]	• Key on • Status ambient temperature from instrument cluster no fault • Electrical check ambient temperature sensor no fault	• 3.0 s • Multiple		
U0447 Invalid Data Received From Gateway "A"	CAN: Gateway CAN Communication With Gateway	• Received data implausible message	• Time after ignition on 500.0 ms	• 300.0 ms • Continuous	• 2 DCY	Check the CAN-Bus terminal resistance. Refer to ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676 .

3.5 Transmission DTC Tables

- ⇒ T3.5.1 ransmission Control Module, AQ250 09G", page 653

3.5.1 Transmission Control Module, AQ250 09G

AQ250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0604	Internal Control Module Random Access Memory (RAM) Error	• RAM area check	• Comparison of writing data and reading data	• Writing data is different from reading one		• 40.0 s	• 2 DCY
P0605	Internal Control Module Read Only Memory (ROM) Error	• ROM area check	• Comparison of stored checksum value and calculated checksum	• Two checksum values are not same		• 40.0 s	• 2 DCY
P0613	TCM Processor	• 2nd CPU detects miscalculation	• Check-calculation of 1st CPU failed	• Single reset does not cover problem		• XX s	• 2 DCY

AQ250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0614	ECM/TCM Incompatible	• CAN receive data check	• Detection of error signal	• Transmission coding is manual transmission code (0Fh) • Or • Max torque is not same as one in ATCU	• CAN bus: ACTIVE • ECU communication: ACTIVE • ECU data update: ACTIVE	• 250.0 ms	• 2 DCY
P0705	Transmission Range Sensor "A" Circuit (PRNDL Input)	• A, B, C and PA signal check in every shift lever position.	• Detection of wrong combination of the A, B, C and PA signal	• Wrong combination for more than 350.0 ms		• 350.0 ms	• 2 DCY
P0715	Input Turbine/ Speed Sensor "A" Circ	• Electrical check	• Detection of wrong input AD value	• Voltage < 0.2 volt (AD value < 45.0) for more than 100.0 ms • Or • (AD value > 545.0) voltage > 3.8 volt for more than 100.0 ms	• Input sensor: no failure decision for input sensor no pulse failure	• 100.0 ms • 5.0 times	• 2 DCY
P0716	Input/ Turbine Shaft Speed Sensor "A" Circuit Range/ Performance	• No pulse check	• Comparison pulse of input revolution and output revolution	• No pulse of input sensor more than 125.0 ms	• Engine speed > 400 RPM • Output sensor: ACTIVE • Output speed >= 300 RPM • Input sensor: no during failure detection or after failure decision for input sensor electrical failure	• 125.0 ms • 4.0 times	• 2 DCY

AQ250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0720	output Shaft Speed Sensor Circuit	• Electrical check	• Detection of wrong input AD value	• Voltage < 0.2 volt (AD value < 45.0) for more than 100.0 ms • Or • (AD value > 545.0) voltage > 3.8 volt for more than 100.0 ms	• Output sensor: no failure decision for output sensor no pulse	• 100.0 ms • 5.0 times	• 2 DCY
P0721	Output Shaft Speed Sensor Circuit Range/ Performance	• No pulse check	• Comparison pulse of input revolution and output revolution	• No pulse of output sensor more than 250.0 ms	• Engine speed: > 400 RPM • Input sensor: ACTIVE • Calculated output speed by input speed: >= 300 RPM • Main solenoid switch: ON • Gear condition: Engage • Range: D,S • Inhibitor switch: no fault • Output sensor: no during failure detection or after failure decision for output sensor electrical failure • Solenoid: no fault (except S2) • Linear solenoid: no fault	• 250.0 ms • 2.0 times	• 2 DCY

AQ250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0725	Engine Speed Input Circuit	• CAN receive data check	• Detection of error signal		• CAN bus: ACTIVE • ECU communication: ACTIVE • ECU data update: ACTIVE	• 250.0 ms	• 2 DCY
P0729	Gear 6 Incorrect Ratio	• Input and output RPM signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input revolutions – output revolutions x other gear ratio) < (0.04 x other gear ratio x output revolutions) for more than 1.0 s • 2. Slip differences > (0.20 x current gear ratio x output revolutions) for more than 1.0 s	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake: OFF • Slip difference of output speed (In case ABS valid) difference < 10.0% • Revolution sensor, no back up condition • Model oil temperature >= 0° C • Common parameter, common condition (see footnote ⇒ page 668)	• 1.0 s • 12.0 times	• 2 DCY • Cumulative

AQ250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0731	Gear 1 Incorrect Ratio	• Input and output RPM signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• ABS (input rev – output rev x other gear ratio) < (0.04 x other gear ratio x output rev) for more than 1.0 s	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Estimated engine torque > 100.0 Nm at 1st gear > 80.0 Nm at 1st EB gear • Shift lever D or S • Brake: OFF • Slip difference of output speed and ABS difference < 10.0% (in case of ABS failure, this condition isn't activated) • Engaged gear, 1st gear • Revolution sensor, no back up condition • Model oil temperature >= 20° C • Common parameter, common condition (see footnote ⇒ page 668)	• 1.0 s • 12.0 times	• 2 DCY • Cumulative

AQ250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		• Neutral condition check	• Detection of slip condition	• Input revolutions > output revolutions x 1st gear ratio + 400 RPM for more than 3.3 s	• Engine speed > 400 RPM • Shift lever D or S • Output revolutions <= 500 RPM • Output revolutions which <= 500 RPM calculated from ABS (In case of ABS failure, this condition isn't activated) • L-up condition: OFF • Input sensor, no back up condition • Output sensor, active or back up by ABS • Model oil temperature >= 0° C • Common parameter, common condition (see footnote ⇒ page 668)	• 2.0 times	• 2 DCY • Cumulative but, in case of changing the shift lever position, counter = 0

AQ250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0732	Gear 2 Incorrect Ratio	• Neutral condition check	• Detection of slip condition	• Input revolutions > output revolutions x 1st gear ratio + 400 RPM for more than 3.3 s	• Engine speed > 400 RPM • Shift lever D or S • Output revolutions <= 500 RPM • Output revolutions which <= 500 RPM calculated from ABS (In case of ABS failure, this condition isn't activated) • L-up condition: OFF • Input sensor, no back up condition • Output sensor, active or back up by ABS • Model oil temperature >= 0° C • Common parameter, common condition (see footnote ⇒ page 668)	• 2.0 times	• 2 DCY • Cumulative but, in case of changing the shift lever position, counter = 0

AQ250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
		• Input and output RPM signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input revolutions – output revolutions x other gear ratio) < (0.04 x other gear ratio x output revolutions) for more than 1.0 s • 2. Slip differences > (0.20 x current gear ratio x output revolutions) for more than 1.0 s	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake: OFF • Slip difference of output speed (In case ABS valid) difference < 10.0% • Revolution sensor, no back up condition • Model oil temperature >= 0° C • Common parameter, common condition (see footnote ⇒ page 668)	• 1.0 s • 12.0 times	• 2 DCY • Cumulative

AQ250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0733	Gear 3 Incorrect Ratio	• Input and output RPM signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input revolutions – output revolutions x other gear ratio) < (0.04 x other gear ratio x output revolutions) for more than 1.0 s • 2. Slip differences > (0.20 x current gear ratio x output revolutions) for more than 1.0 s	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake: OFF • Slip difference of output speed (In case ABS valid) difference < 10.0% • Revolution sensor, no back up condition • Model oil temperature >= 0° C • Common parameter, common condition (see footnote ⇒ page 668)	• 1.0 s • 12.0 times	• 2 DCY • Cumulative

AQ250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0734	Gear 4 Incorrect Ratio	• Input and output RPM signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input revolutions – output revolutions x other gear ratio) < (0.04 x other gear ratio x output revolutions) for more than 1.0 s • 2. Slip differences > (0.20 x current gear ratio x output revolutions) for more than 1.0 s	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake: OFF • Slip difference of output speed (In case ABS valid) difference < 10.0% • Revolution sensor, no back up condition • Model oil temperature >= 0° C • Common parameter, common condition (see footnote ⇒ page 668)	• 1.0 s • 12.0 times	• 2 DCY • Cumulative

AQ250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0735	Gear 5 Incorrect Ratio	• Input and output RPM signal check. Separate error memory for each gear.	• Comparison of indicated slip and actual slip with stored values	• 1. ABS (input revolutions – output revolutions x other gear ratio) < (0.04 x other gear ratio x output revolutions) for more than 1.0 s • 2. Slip differences > (0.20 x current gear ratio x output revolutions) for more than 1.0 s	• Engine speed > 400 RPM • Output revolutions > 250 RPM • Shift lever D or S • Brake: OFF • Slip difference of output speed (In case ABS valid) difference < 10.0% • Revolution sensor, no back up condition • Model oil temperature >= 0° C • Common parameter, common condition (see footnote ⇒ page 668)	• 1.0 s • 12.0 times	• 2 DCY • Cumulative
P0743	Torque Converter Clutch Circuit Electrical	• Input AD value check in every linear solenoid.	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA (AD value > 1,000.0) for more than 100.0 ms		• 100.0 ms • 5.0 times	• 2 DCY
				• Feedback current < 23.0 mA (AD value < 15.0) for more than 100.0 ms	• Main solenoid switch: ON		
		• Linear solenoid feedback current check	• Comparison of target current and feedback current	• Sum of difference of two current > 20,000.0 Ω	• Linear feedback current is > 23.0 mA (AD: 15.0) < 1,333.0 mA (AD: 1,000.0)	• 2.0 times	• 2 DCY • Continuously

AQ250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0748	Pressure Control Solenoid "A" Electrical	• Input AD value check in every linear solenoid.	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA (AD value > 1,000.0) for more than 100.0 ms		• 100.0 ms • 5.0 times	• 2 DCY
				• feedback current < 23 mA (AD value < 15.0) for more than 100 ms	• Main solenoid switch: ON		
		• Linear solenoid feedback current check	• Comparison of target current and feedback current	• Sum of difference of two current > 20,000.0 Ω	• Linear feedback current is > 23.0 mA (AD: 15.0) < 1,333.0 mA (AD: 1,000.0)	• 2.0 times	• 2 DCY • Continuously
P0753	Shift Solenoid "A" Electrical	• Conduction check in ON/OFF solenoid.	• Comparison of the signal of solenoid monitor and solenoid driver output	• Wrong output signal for more than 100.0 ms		• 100.0 ms • 5.0 times	• 2 DCY
P0798	Pressure Control Solenoid "C" Electrical	• Input AD value check in every linear solenoid.	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA (AD value > 1,000.0) for more than 100.0 ms		• 100.0 ms • 5.0 times	• 2 DCY
				• Feedback current < 23.0 mA (AD value < 15.0) for more than 100.0 ms	• Main solenoid switch: ON		
		• Linear solenoid feedback current check	• Comparison of target current and feedback current	• Sum of difference of two current > 20,000.0 Ω	• Linear feedback current is > 23.0 mA (AD: 15.0) < 1,333.0 mA (AD: 1,000.0)	• 2.0 times	• 2 DCY • Continuously

AQ250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P0811	Excessive Clutch "A" Slippage	• OFF stuck check.	• Comparison of engine RPM and input RPM	• Engine RPM – input RPM > 100 RPM for 2.0 s	• Engine speed > 400 RPM • Shift lever D or S • Engine speed < 4,000 RPM • Estimated engine torque >= 0.0 Nm • Revolution sensor, no back up condition • SLU target current > 1,000.0 mA • Model oil temperature >= 20° C • Common parameter, common condition (see footnote ⇒ page 668)	• 2.0 s • 6.0 times	• 2 DCY • Continuously
P0864	TCM Communication Circuit Range/ Performance	• CAN communication check	• Detection of communication error (all frames which are entered in ATCU)	• ECU no communication for more than 50.0 ms (In case of repeat rate is over 25.0 ms, double value of repeat rate is used)	• CAN bus: ACTIVE • Time: 500.0 ms after ignition: ON	• 500.0 ms (In case of re peat rate is over 50.0 ms, 10.0 times value of repeat rate is used)	• 2 DCY

AQ250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
			• Detection of communication error (one frame which is entered in ATCU)	• ECU no communication for more than 50.0 ms (In case of repeat rate is over 25.0 ms, double value of repeat rate is used)	• CAN bus: ACTIVE • Time: 500.0 ms after ignition: ON • ECU communication: not in no communication failure	• 1,000.0 ms (In case of repeat rate is over 50.0 ms, 20.0 times value of repeat rate is used)	
		• CAN receive data check	• ECU signal data freeze (data counter (ID488, Byte8, Bit7…4) not updated)		• CAN bus: ACTIVE • CAN data repeat rate: the space of time between two received messages has not exceeded double the transmission cycle time	• No update in five message	
		• CAN communication check	• Detection of communication error	• No acknowledge condition for more than 300.0 ms	• CAN bus: ACTIVE • Time: 500.0 ms after ignition: ON	• 300.0 ms	
P0865	TCM Communication Circuit Low	• CAN communication check	• Detection of communication error	• CAN BUS off condition for more than 250.0 ms	• Time 500.0 ms after ignition: ON	• 250.0 ms	• 2 DCY
P2122	Throttle/ Pedal Position Sensor/ Switch "D" Circuit Low	• CAN communication check	• Detection of error signal		• CAN bus: ACTIVE • ECU communication: ACTIVE • ECU data update: ACTIVE	• 250.0 ms	• 2 DCY

AQ250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2637	Torque Management Feedback Signal "A"	• CAN receive data check for “signal invalid”	• Detection of error signal (0xFF)		• CAN bus: ACTIVE • ECU communication: ACTIVE • ECU data update: ACTIVE	• 250.0 ms	• 2 DCY
P2716	Pressure Control Solenoid "D" Electrical	• Input AD value check in every linear solenoid.	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA (AD value > 1,000.0) for more than 100.0 ms		• 100.0 ms • 5 times	• 2 DCY
				• Feedback current < 23.0 mA (AD value < 15.0) for more than 100.0 ms	• Main solenoid switch: ON	• 100.0 ms • 5.0 times	• 2 DCY
		• Linear solenoid feedback current check	• Comparison of target current and feedback current	• Sum of difference of two current > 20,000.0 Ω	• Linear feedback current is > 23.0 mA (AD: 15.0) < 1,333.0 mA (AD: 1000.0)	• 2.0 times	• 2 DCY • Continuously
P2725	Pressure Control Solenoid "E" Electrical	• Input AD value check in every linear solenoid.	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA (AD value > 1,000.0) for more than 100.0 ms		• 100.0 ms • 5.0 times	• 2 DCY
				• Feedback current < 23.0 mA (AD value < 15.0) for more than 100.0 ms	• Main solenoid switch: ON	• 100.0 ms • 5.0 times	• 2 DCY
		• Linear solenoid feedback current check	• Comparison of target current and feedback current	• Sum of difference of two current > 20,000.0 Ω	• Linear feedback current is > 23.0 mA (AD: 15.0) < 1,333.0 mA (AD: 1,000.0)	• 2.0 times	• 2 DCY • Continuously

AQ250 09G							
DTC	Fault Code Description	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters with Enable Conditions	Monitoring Time Length	Frequency of checks, MIL Illum
P2734	Pressure Control Solenoid "F" Electrical	• Input AD value check in every linear solenoid.	• Detection of wrong input AD value	• Feedback current > 1,333.0 mA (AD value > 1,000) for more than 100.0 ms		• 100.0 ms • 5.0 times	• 2 DCY
				• Feedback current < 23.0 mA (AD value < 15.0) for more than 100.0 ms	• Main solenoid switch: ON	• 100.0 ms • 5.0 times	• 2 DCY
		• Linear solenoid feedback current check	• Comparison of target current and feedback current	• Sum of difference of two current > 20,000.0 Ω	• Linear feedback current is > 23.0 mA (AD: 15.0) < 1,333.0 mA (AD: 1,000.0)	• 2.0 times	• 2 DCY • Continuously

Footnote:

- Main solenoid switch ON
- Gear condition engaged
- S1 solenoid No fault
- Linear solenoid no fault
- Inhibitor switch no fault
- CAN communication no fault
- ECU data update no fault
- Estimated engine torque no fault
- Engine speed no fault
- Accelerator pedal no fault
- T/M coding and MDI max info no fault
- ROM no fault
- RAM no fault
- Safety processor no fault

3.6 Diagnostic Procedures

- ⇒ A3.6.1 ccelerator Pedal Module GX2, Checking”, page 670
- ⇒ C3.6.2 amshaft Adjustment Valve 1 N205, Checking”, page 672
- ⇒ C3.6.3 amshaft Position Sensor G40, Checking”, page 674

- ⇒ C3.6.4 AN-Bus Terminal Resistance, Checking", page 676
- ⇒ C3.6.5 AN-Bus Terminal Resistance, Powertrain, Checking", page 678
- ⇒ C3.6.6 enter Oxygen Sensor for Bank 1 Catalytic Converter G465, Checking (CBUA)", page 680
- ⇒ E3.6.7 ngine Coolant Temperature Sensor G62, Checking", page 683
- ⇒ E3.6.8 ngine Coolant Temperature Sensor on Radiator Outlet G83, Checking", page 685
- ⇒ E3.6.9 ngine Speed Sensor G28, Checking", page 686
- ⇒ E3.6.10 VAP Canister Purge Regulator Valve 1 N80, Checking", page 688
- ⇒ F3.6.11 uel Delivery Unit GX1 / Fuel Pump Relay J17, Checking", page 690
- ⇒ F3.6.12 uel Delivery Unit GX1 / Fuel Supply Relay J643, Checking", page 692
- ⇒ F3.6.13 uel Injectors, Checking", page 694
- ⇒ I3.6.14 gnition Coils With Power Output Stage, Checking", page 696
- ⇒ I3.6.15 ntake Manifold Sensor GX9, Checking", page 698
- ⇒ K3.6.16 nock Sensor 1 G61, Checking", page 700
- ⇒ K3.6.17 nock Sensor 2 G66, Checking", page 702
- ⇒ L3.6.18 eak Detection Pump V144, Checking (3 Pin)", page 704
- ⇒ L3.6.19 eak Detection Pump V144, Checking (4 Pin)", page 706
- ⇒ M3.6.20 otronic Engine Control Module Power Supply Relay J271, Checking", page 709
- ⇒ O3.6.21 utside Air Temperature Sensor G17, Checking", page 711
- ⇒ O3.6.22 xygen Sensor 1 After Catalytic Converter GX7, Checking", page 713
- ⇒ O3.6.23 xygen Sensor 1 Before Catalytic Converter GX10, Checking", page 716
- ⇒ S3.6.24 econdary Air Injection Pump Relay J299 / Secondary Air Injection Pump Motor V101, Checking", page 719
- ⇒ S3.6.25 econdary Air Injection Sensor 1 G609, Checking", page 721
- ⇒ S3.6.26 econdary Air Injection Solenoid Valve N112, Checking", page 723
- ⇒ T3.6.27 hree Way Catalytic Converter (TWC), Checking", page 725
- ⇒ T3.6.28 hrottle Valve Control Module GX3 / J338, Checking", page 726
- ⇒ V3.6.29 ehicle Speed Signal, Checking", page 729

3.6.1 Accelerator Pedal Module - GX2-, Checking

General Description

The Accelerator Pedal Position Sensor -G79- and the Accelerator Pedal Position Sensor 2 -G185- are combined in one component and integrated into the Accelerator Pedal Module -GX2-. They are used to detect the position of the accelerator pedal throughout the entire adjustment range. The Engine/Motor Control Module - J623- detects the driver's request from these signals and uses them to calculate the injection quantity and EPC Throttle valve operation.

The Accelerator Pedal Module - GX2- contains the following components:

- ♦ Accelerator Pedal Position Sensor -G79-.
- ♦ Accelerator Pedal Position Sensor 2 -G185-.

The Accelerator Pedal Module - GX2- components cannot be serviced separately, and they must be serviced as a unit.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 671 . – NO: ♦ GATHER more information from customer about the complaint.

Step	Procedure	Result / Action to Take
2	• IGNITION: OFF. • CONNECT: Scan Tool. • IGNITION: ON. • CHECK: Throttle valve position closed: • SPECIFIED VALUE: 3 – 25%. • DEPRESS: Accelerator pedal slowly to WOT while observing the percentage display. The percentage display must increase uniformly. • CHECK: Throttle valve position at WOT: • SPECIFIED VALUE: 84 – 99%. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ CONDITION: May be intermittent. ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 672 . – NO: ♦ GO TO: Step 3 ⇒ page 671 .
3	• DISCONNECT: Accelerator Pedal Module - GX2- harness connector. • IGNITION: ON. • CHECK: Accelerator Pedal Module - GX2- harness connector terminals 1 to 5 and 2 to 3 for voltage. • IGNITION: OFF. • SPECIFIED VALUE: About 5.0 V. – Were Values obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 671 . – NO: ♦ GO TO: Step 5 ⇒ page 672 .
4	• REMOVE: Engine/Motor Control Module - J623-. Refer to appropriate repair manual. • CHECK: Accelerator Pedal Module - GX2- harness connector terminal 4 to the Engine/Motor Control Module -J623- harness connector T94 / 83 for resistance. • CHECK: Accelerator Pedal Module - GX2- harness connector terminal 6 to the Engine/Motor Control Module -J623- harness connector T94 / 61 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ REPLACE: Accelerator Pedal Module - GX2-. Refer to appropriate repair manual. ♦ GO TO: Step 6 ⇒ page 672 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 672 .

Step	Procedure	Result / Action to Take
5	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • CHECK: Accelerator Pedal Module - GX2- harness connector terminal 1 to the Engine/Motor Control Module -J623- harness connector T94 / 81 for resistance. • CHECK: Accelerator Pedal Module - GX2- harness connector terminal 2 to the Engine/Motor Control Module -J623- harness connector T94 / 82 for resistance. • CHECK: Accelerator Pedal Module - GX2- harness connector terminal 3 to the Engine/Motor Control Module -J623- harness connector T94 / 17 for resistance. • CHECK: Accelerator Pedal Module - GX2- harness connector terminal 5 to the Engine/Motor Control Module -J623- harness connector T94 / 11 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ GO TO: Step 6 ⇒ page 672 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 672 .
6	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.2 Camshaft Adjustment Valve 1 -N205-, Checking

General Description

The camshaft's task is to operate the valves at the right time and in the right order to control the charge cycle. Camshaft adjustment using the Camshaft Adjustment Valve 1 -N205- varies the opening times of the valves to suit all operating conditions. This ensures ideal charge cycles within a wide range of engine speeds and loads. Fuel consumption and pollutant emissions are reduced, torque and smoothness increased. In engines with a double overhead camshaft the size and positioning of the valve opening overlap can be influenced, enhancing characteristics in full-load and part-load operation. In continuous

camshaft adjustment, the adjustment is infinitely variable within specific parameters.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 673 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Camshaft Adjustment Valve 1 -N205- harness connector. • CHECK: Camshaft Adjustment Valve 1 -N205- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 5 – 20 Ω (+/- 3 Ω @ approx. 20° C). – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 673 . – NO: ♦ REPLACE: Camshaft Adjustment Valve 1 -N205-. Refer to appropriate repair manual. ♦ GO TO: Step 5 ⇒ page 674 .
3	• IGNITION: ON. • For all 1K2, 5K1, A32, (and AJ5 from July 2010): CHECK: Camshaft Adjustment Valve 1 -N205- harness connector terminal 1 to ground for voltage. • For 162 (from April 2010): CHECK: Camshaft Adjustment Valve 1 -N205- harness connector terminal 2 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Was Value obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 674 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 674 .

Step	Procedure	Result / Action to Take
4	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • For all 1K2, 5K1, A32, (and AJ5 from July 2010): CHECK: Camshaft Adjustment Valve 1 -N205- harness connector terminal 2 to the Engine/Motor Control Module -J623- harness connector T60 / 1 for resistance. • For 162 (from April 2010): CHECK: Camshaft Adjustment Valve 1 -N205- harness connector terminal 1 to the Engine/Motor Control Module -J623- harness connector T60 / 1 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ♦ TIP: The Camshaft Adjustment Valve 1 -N205- may fail under loaded operation; please swap a known good Camshaft Adjustment Valve 1 -N205- prior to continuing to the next step. ♦ GO TO: Step 5 ⇒ page 674 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 674 .
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return, the repair is complete. ♦ Return vehicle to customer.

3.6.3 Camshaft Position Sensor - G40-, Checking

General Description

Using the signal from the Camshaft Position Sensor -G40-, the precise position of the camshaft relative to the crankshaft is determined very quickly when the engine is started. Used in combination with the signal from the Engine Speed Sensor -G28-, the signal from the Camshaft Position Sensor -G40- allows the Engine/Motor Control Module -J623- to detect which cylinder is at TDC. The fuel can be injected into the corresponding cylinder and ignited.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 675 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Camshaft Position Sensor - G40- harness connector. • IGNITION: ON. • CHECK: Camshaft Position Sensor -G40- harness connector terminals 1 to 3 for voltage. • IGNITION: OFF. • SPECIFIED VALUE: About 5.0 V. – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 675 . – NO: ◆ GO TO: Step 4 ⇒ page 676 .
3	• REMOVE: Engine/Motor Control Module - J623-. Refer to appropriate repair manual. • CHECK: Camshaft Position Sensor -G40- harness connector terminal 2 to the Engine/Motor Control Module - J623- harness connector T60 / 6 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ REPLACE: Camshaft Position Sensor -G40-. Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 676 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 676 .

Step	Procedure	Result / Action to Take
4	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • CHECK: Camshaft Position Sensor -G40- harness connector terminal 1 to the Engine/Motor Control Module - J623- harness connector T60 / 44 for resistance. • CHECK: Camshaft Position Sensor -G40- harness connector terminal 3 to the Engine/Motor Control Module - J623- harness connector T60 / 52 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ GO TO: Step 5 ⇒ page 676 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 676 .
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.4 CAN-Bus Terminal Resistance, Checking

General Description

The Engine/Motor Control Module -J623- communicates with all databus capable control modules via a CAN databus.

These databus capable control modules are connected via two data bus wires which are twisted together (CAN_High and CAN_Low), and exchange information (messages). Missing information on the databus (CAN-bus) is recognized as a malfunction and may be stored by the Engine/Motor Control Module -J623- and the other control modules connected to the CAN-bus.

Trouble-free operation of the CAN-bus requires that it have a terminal resistance. This central terminal resistor is located in the Engine/Motor Control Module -J623-.

Special tools and workshop equipment required

◆ Multimeter.

◆ Wiring Diagram.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 677 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Data Bus On Board Diagnostic Interface -J533- harness connector. • The Engine/Motor Control Module -J623- must remain connected for the following step. • For all except 162: CHECK: Data Bus On Board Diagnostic Interface -J533- harness connector terminals 6 to 16 for resistance. • For 162 only: CHECK: Data Bus On Board Diagnostic Interface -J533- harness connector terminals 18 to 19 for resistance. • SPECIFIED VALUE: 60 – 72 Ω (@ approx. 20° C). – Was Value obtained?	– YES: ◆ CONDITION: May be intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 678 . – NO: ◆ GO TO: Step 3 ⇒ page 678 .

Step	Procedure	Result / Action to Take
3	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • For all except 162: CHECK: Data Bus On Board Diagnostic Interface -J533- harness connector terminal 6 to the Engine/Motor Control Module - J623- harness connector T94 / 67 for resistance. • For all except 162: CHECK: Data Bus On Board Diagnostic Interface -J533- harness connector terminal 16 to the Engine/Motor Control Module - J623- harness connector T94 / 68 for resistance. • For 162 only: CHECK: Data Bus On Board Diagnostic Interface -J533- harness connector terminal 18 to the Engine/Motor Control Module - J623- harness connector T94 / 67 for resistance. • For 162 only: CHECK: Data Bus On Board Diagnostic Interface -J533- harness connector terminal 19 to the Engine/Motor Control Module - J623- harness connector T94 / 68 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ◆ GO TO: Step 4 ⇒ page 678 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 678 .
4	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Data Bus On Board Diagnostic Interface -J533- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Data Bus On Board Diagnostic Interface -J533-. Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.5 CAN-Bus Terminal Resistance, Powertrain, Checking

General Description

The Engine/Motor Control Module -J623- communicates with all databus capable control modules via a CAN databus.

These databus capable control modules are connected via two data bus wires which are twisted together (CAN_High and CAN_Low), and exchange information (messages). Miss-

ing information on the databus (CAN-bus) is recognized as a malfunction and may be stored by the Engine/Motor Control Module -J623- and the other control modules connected to the CAN-bus.

Trouble-free operation of the CAN-bus requires that it have a terminal resistance. This central terminal resistor is located in the Engine/Motor Control Module -J623-.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 679 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • The Engine/Motor Control Module -J623- must remain connected for the following step. The central terminal resistor is located in the Engine/Motor Control Module -J623-. • REMOVE: Transmission Control Module. Refer to appropriate repair manual. • CHECK: Transmission Control Module harness connector terminals 34 to 46 for resistance. • SPECIFIED VALUE: 60 – 72 Ω (@ approx. 20° C). – Was Value obtained?	– YES: ♦ CONDITION: May be intermittent. ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 4 ⇒ page 680 . – NO: ♦ GO TO: Step 3 ⇒ page 680 .

Step	Procedure	Result / Action to Take
3	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • CHECK: CAN bus circuit between the Transmission Control Module harness connector terminal 34 and the Engine/Motor Control Module -J623- harness connector T94 / 67 for resistance. • CHECK: CAN bus circuit between the Transmission Control Module harness connector terminal 46 and the Engine/Motor Control Module -J623- harness connector T94 / 68 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ◆ GO TO: Step 4 ⇒ page 680 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 680 .
4	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Transmission Control Module harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Transmission Control Module. Refer to appropriate repair manual. ◆ Clear the DTC’s. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory”, page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode”, page 15 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC’s. ◆ If no DTC’s return, the repair is complete. ◆ Return vehicle to customer.

3.6.6 Center Oxygen Sensor for Bank 1 Catalytic Converter - G465-, Checking (CBUA)

General Description

The Center Oxygen Sensor for Bank 1 Catalytic Converter -G465- is positioned downstream of the primary catalytic converter and it supplies the Engine/Motor Control Module -J623- with a voltage signal (nonlinear) indicating a “rich” or a “lean“ condition is present. If the primary catalytic converter is supersaturated with oxygen (indicating a lean mixture is present), the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465- will send the Engine/Motor Control Module -J623- a nonlinear signal indicating the lean mixture condition. The mixture is then enriched with fuel until the oxygen has been “displaced” from the catalytic converter. This new condition, in turn, is registered by the Center Oxygen Sensor for Bank 1 Catalytic Converter -G465- as a nonlinear signal indicating the rich mixture condition. The mixture is then leaned out by the Engine/Motor Control Module -J623-. If the nonlinear signal is received again, the mixture will again be enriched. The frequen-

cy, or period, during which the mixture is enriched or leaned out is variable, being dependent on the gas flow rate (engine load) at that moment.

The Center Oxygen Sensor for Bank 1 Catalytic Converter -G465- contains the following components:

- Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-.
- Heater for Oxygen Sensor Center Catalytic Converter -Z59-.

The Center Oxygen Sensor for Bank 1 Catalytic Converter -G465- components cannot be serviced separately, and they must be serviced as a unit.

Special tools and workshop equipment required

- Multimeter.
- Wiring Diagram.
- Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions", page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions", page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to Oxygen Sensor Preliminary Tests in ⇒ C3.1 heck", page 14 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 681 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Center Oxygen Sensor for Bank 1 Catalytic Converter -G465- harness connector. • CHECK: Center Oxygen Sensor for Bank 1 Catalytic Converter -G465- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 2 – 4 Ω (+/- 0.5 Ω @ 25° C). – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 682 . – NO: ♦ REPLACE: Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to appropriate repair manual. ♦ GO TO: Step 6 ⇒ page 683 .

Step	Procedure	Result / Action to Take
3	• IGNITION: ON. • CHECK: Center Oxygen Sensor for Bank 1 Catalytic Converter -G465- harness connector terminal 1 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Was Value obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 682 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 683 .
4	• RECONNECT: Center Oxygen Sensor for Bank 1 Catalytic Converter -G465- harness connector. • CONNECT: Scan Tool. • START: Engine and let Idle. • Perform the function test located in diagnostic mode 06. Refer to appropriate Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions, ⇒ M3.3 odes 01 – 0A”, page 17 . • IGNITION: OFF. • SPECIFIED VALUE: Mode 6 Pass. – Were Values obtained?	– YES: ♦ FAULT: Is intermittent. ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 683 . – NO: ♦ GO TO: Step 5 ⇒ page 682 .
5	• DISCONNECT: Center Oxygen Sensor for Bank 1 Catalytic Converter -G465- harness connector. • REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • CHECK: Center Oxygen Sensor for Bank 1 Catalytic Converter -G465- harness connector terminal 2 to the Engine/Motor Control Module -J623- harness connector T94 / 51 for resistance. • CHECK: Center Oxygen Sensor for Bank 1 Catalytic Converter -G465- harness connector terminal 3 to the Engine/Motor Control Module -J623- harness connector T94 / 71 for resistance. • CHECK: Center Oxygen Sensor for Bank 1 Catalytic Converter -G465- harness connector terminal 4 to the Engine/Motor Control Module -J623- harness connector T94 / 62 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ REPLACE: Center Oxygen Sensor for Bank 1 Catalytic Converter -G465-. Refer to appropriate repair manual. ♦ GO TO: Step 6 ⇒ page 683 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 683 .

Step	Procedure	Result / Action to Take
6	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return, the repair is complete. ♦ Return vehicle to customer.

3.6.7 Engine Coolant Temperature Sensor -G62-, Checking

General Description

The Engine Coolant Temperature Sensor -G62- sends information about the current coolant temperature to the Engine/Motor Control Module -J623-. It uses the coolant temperature as a correction value for calculating the injection quantity.

Special tools and workshop equipment required

♦ Multimeter.

♦ Wiring Diagram.

♦ Scan Tool.

Test requirements

• Fuses OK.

• Battery voltage OK.

• Switch OFF all electrical and electronic accessories.

• Vehicles with automatic transmission, ensure the selector lever position is in "P".

• Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.

• Observe all safety precautions: ⇒ P1.1 recautions", page 2 .

• View clean working conditions: ⇒ W1.2 orking Conditions", page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck", page 14 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 684 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Engine Coolant Temperature Sensor -G62- harness connector. • CHECK: Engine Coolant Temperature Sensor -G62- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 2,250 Ω (+/- 750 Ω @ approx. 20° C). – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 684 . – NO: ◆ REPLACE: Engine Coolant Temperature Sensor -G62-. Refer to appropriate repair manual. ◆ GO TO: Step 4 ⇒ page 684 .
3	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • CHECK: Engine Coolant Temperature Sensor -G62- harness connector terminal 1 to the Engine/Motor Control Module - J623- harness connector T60 / 57 for resistance. • CHECK: Engine Coolant Temperature Sensor -G62- harness connector terminal 2 to the Engine/Motor Control Module - J623- harness connector T60 / 14 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ TIP: The Engine Coolant Temperature Sensor -G62- may fail under loaded operation; please swap a known good Engine Coolant Temperature Sensor -G62- prior to continuing to the next step. ◆ GO TO: Step 4 ⇒ page 684 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 684 .
4	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.8 Engine Coolant Temperature Sensor on Radiator Outlet - G83-, Checking

General Description

The Engine Coolant Temperature Sensor On Radiator Outlet -G83- sends information about the current coolant temperature to the Engine/Motor Control Module -J623-. It uses the coolant temperature as a correction value for calculating the injection quantity.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1recautions”, page 2 .
- View clean working conditions: ⇒ W1.2orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 685 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Engine Coolant Temperature Sensor On Radiator Outlet -G83- harness connector. • CHECK: Engine Coolant Temperature Sensor On Radiator Outlet -G83- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 2,250 Ω (+/- 750 Ω @ approx. 20° C). – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 686 . – NO: ♦ REPLACE: Engine Coolant Temperature Sensor On Radiator Outlet -G83-. Refer to appropriate repair manual. ♦ GO TO: Step 4 ⇒ page 686 .

Step	Procedure	Result / Action to Take
3	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • For 5K1 (from May 2009 – Oct 2010): CHECK: Engine Coolant Temperature Sensor On Radiator Outlet -G83- harness connector terminal 1 to the Engine/Motor Control Module - J623- harness connector T94 / 36 for resistance. • For all others: CHECK: Engine Coolant Temperature Sensor On Radiator Outlet -G83- harness connector terminal 1 to the Engine/Motor Control Module - J623- harness connector T94 / 18 for resistance. • CHECK: Engine Coolant Temperature Sensor On Radiator Outlet -G83- harness connector terminal 2 to the Engine/Motor Control Module - J623- harness connector T94 / 12 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ TIP: The Engine Coolant Temperature Sensor On Radiator Outlet -G83- may fail under loaded operation; please swap a known good Engine Coolant Temperature Sensor On Radiator Outlet -G83- prior to continuing to the next step. ♦ GO TO: Step 4 ⇒ page 686 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 4 ⇒ page 686 .
4	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return, the repair is complete. ♦ Return vehicle to customer.

3.6.9 Engine Speed Sensor - G28-, Checking

General Description

The Engine Speed Sensor -G28- detects rpm and reference marks from a toothed wheel on the crankshaft. Without an engine speed signal, the engine will not start. If the engine speed signal fails while the engine is running, the engine will stop immediately.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.

- Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 687 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • CONNECT: Scan Tool. • START or CRANK: Engine. • CHECK: Engine rpm. • SPECIFIED VALUE: Cranking or Idle rpm. • IGNITION: OFF. – Was Value obtained?	– YES: ◆ CONDITION: May be intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 688 . – NO: ◆ GO TO: Step 3 ⇒ page 687 .
3	• DISCONNECT: Engine Speed Sensor -G28- harness connector. • REMOVE: Engine/Motor Control Module - J623-. Refer to appropriate repair manual. • CHECK: Engine Speed Sensor -G28- harness connector terminal 1 to the Engine/Motor Control Module - J623- harness connector T60 / 59 for resistance. • CHECK: Engine Speed Sensor -G28- harness connector terminal 2 to the Engine/Motor Control Module - J623- harness connector T60 / 51 for resistance. • CHECK: Engine Speed Sensor -G28- harness connector terminal 3 to the Engine/Motor Control Module - J623- harness connector T60 / 52 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ REMOVE: Engine Speed Sensor -G28-. Refer to appropriate repair manual. ◆ CHECK: Engine Speed Sensor -G28- sensor wheel for proper seating, damage and/or run - out. Repair as required. Refer to appropriate repair manual. ◆ Sensor wheel OK. ◆ REPLACE: Engine Speed Sensor -G28-. Refer to appropriate repair manual. ◆ GO TO: Step 4 ⇒ page 688 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 688 .

Step	Procedure	Result / Action to Take
4	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ◆ Clear the DTC’s. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory”, page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode”, page 15 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC’s. ◆ If no DTC’s return, the repair is complete. ◆ Return vehicle to customer.

3.6.10 EVAP Canister Purge Regulator Valve 1 - N80-, Checking

General Description

The EVAP system is designed so the admission of fuel vapors takes place only at idle and at light part-throttle. The EVAP Canister Purge Regulator Valve 1 -N80- is activated by the Engine/Motor Control Module -J623- to accomplish this task.

Special tools and workshop equipment required

◆ Multimeter.

◆ Wiring Diagram.

◆ Scan Tool.

Test requirements

• Fuses OK.

• Battery voltage OK.

• Switch OFF all electrical and electronic accessories.

• Vehicles with automatic transmission, ensure the selector lever position is in “P”.

• Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.

• Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .

• View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck", page 14 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 689 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: EVAP Canister Purge Regulator Valve 1 -N80- harness connector. • CHECK: EVAP Canister Purge Regulator Valve 1 -N80- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 15 – 35 Ω (+/- 5 Ω). – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 689 . – NO: ♦ REPLACE: EVAP Canister Purge Regulator Valve 1 -N80-. Refer to appropriate repair manual. ♦ GO TO: Step 5 ⇒ page 690 .
3	• IGNITION: ON. • CHECK: EVAP Canister Purge Regulator Valve 1 -N80- harness connector terminal 1 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Was Value obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 689 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 690 .
4	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • CHECK: EVAP Canister Purge Regulator Valve 1 -N80- harness connector terminal 2 to the Engine/Motor Control Module - J623- harness connector T60 / 32 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ♦ TIP: The EVAP Canister Purge Regulator Valve 1 -N80- may fail under loaded operation; please swap a known good EVAP Canister Purge Regulator Valve 1 -N80- prior to continuing to the next step. ♦ GO TO: Step 5 ⇒ page 690 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 690 .

Step	Procedure	Result / Action to Take
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return, the repair is complete. ♦ Return vehicle to customer.

3.6.11 Fuel Delivery Unit - GX1- / Fuel Pump Relay - J17-, Checking

General Description

Note

If the vehicle is also equipped with a Fuel Supply Relay -J643-, it may be necessary to follow that pinpoint test also. Some vehicles were not equipped with this specific relay.

The Fuel Pump Relay -J17- is cycled on and off by the Engine/Motor Control Module -J623-, thereby providing power to the Transfer Fuel Pump -G6-, which is contained within the Fuel Delivery Unit -GX1-.

The Fuel Delivery Unit -GX1- contains the following components:

♦ Transfer Fuel Pump -G6-.

♦ Fuel Level Sensor -G-.

The Fuel Delivery Unit -GX1- components cannot be serviced separately, and they must be serviced as a unit.

Special tools and workshop equipment required

♦ Multimeter.

♦ Wiring Diagram.

♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.

- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 691 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • REMOVE: Fuel Pump Relay -J17-. Refer to appropriate repair manual. • IGNITION: ON. • CHECK: Fuel Pump Relay -J17- socket terminals 30 and 86 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Were Values obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 691 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 692 .
3	• CONNECT: Jumper wire, between the Fuel Pump Relay -J17- socket terminals 30 and 87. • IGNITION: ON. • SPECIFIED VALUE: Transfer Fuel Pump -G6- should be heard running. • IGNITION: OFF. – Was Value obtained?	– YES: ◆ GO TO Step 4 ⇒ page 691 . – NO: ◆ GO TO: Step 5 ⇒ page 692 .
4	• DISCONNECT: Jumper wire, between the Fuel Pump Relay -J17- socket terminals 30 and 87. • REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • CHECK: Fuel Pump Relay -J17- socket terminal 85 to the Engine/Motor Control Module -J623- harness connector T94 / 93 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ REPLACE: Fuel Pump Relay -J17-. Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 692 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 692 .

Step	Procedure	Result / Action to Take
5	• DISCONNECT: Jumper wire, between the Fuel Pump Relay -J17- socket terminals 30 and 87. • DISCONNECT: Fuel Delivery Unit -GX1- harness connector. • CHECK: Fuel Pump Relay -J17- socket terminal 87 to the Fuel Delivery Unit -GX1- harness connector terminal 1 for resistance. • CHECK: Fuel Delivery Unit -GX1- harness connector terminal 5 to ground for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ REPLACE: Fuel Delivery Unit -GX1-. Refer to appropriate repair manual. ♦ GO TO: Step 6 ⇒ page 692 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 692 .
6	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return, the repair is complete. ♦ Return vehicle to customer.

3.6.12 Fuel Delivery Unit - GX1- / Fuel Supply Relay - J643-, Checking

General Description

The Fuel Supply Relay -J643- is cycled on and off by the Vehicle Electrical System Control Module -J519-, thereby providing power to the Transfer Fuel Pump -G6-, which is contained within the Fuel Delivery Unit -GX1-.

The Fuel Delivery Unit -GX1- contains the following components:

- ♦ Transfer Fuel Pump -G6-.
- ♦ Fuel Level Sensor -G-.

The Fuel Delivery Unit -GX1- components cannot be serviced separately, and they must be serviced as a unit.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.

♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 693 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • REMOVE: Fuel Supply Relay -J643-. Refer to appropriate repair manual. • IGNITION: ON. • CHECK: Fuel Supply Relay -J643- socket terminals 30 and 86 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Were Values obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 693 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 694 .
3	• CONNECT: Jumper wire, between the Fuel Supply Relay -J643- socket terminals 30 and 87. • IGNITION: ON. • SPECIFIED VALUE: Transfer Fuel Pump -G6- should be heard running. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ GO TO Step 4 ⇒ page 693 . – NO: ♦ GO TO: Step 5 ⇒ page 694 .
4	• DISCONNECT: Jumper wire, between the Fuel Supply Relay -J643- socket terminals 30 and 87. • REMOVE: Vehicle Electrical System Control Module -J519-. Refer to appropriate repair manual. • CHECK: Fuel Supply Relay -J643- socket terminal 85 to the Vehicle Electrical System Control Module -J519- harness connector N / 38 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ♦ REPLACE: Fuel Supply Relay -J643-. Refer to appropriate repair manual. ♦ GO TO: Step 6 ⇒ page 694 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 694 .

Step	Procedure	Result / Action to Take
5	• DISCONNECT: Jumper wire, between the Fuel Supply Relay -J643- socket terminals 30 and 87. • DISCONNECT: Fuel Delivery Unit -GX1- harness connector. • CHECK: Fuel Supply Relay -J643- socket terminal 87 to the Fuel Delivery Unit -GX1- harness connector terminal 1 for resistance. • CHECK: Fuel Delivery Unit -GX1- harness connector terminal 5 to ground for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ REPLACE: Fuel Delivery Unit -GX1-. Refer to appropriate repair manual. ♦ GO TO: Step 6 ⇒ page 694 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 694 .
6	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Vehicle Electrical System Control Module -J519- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Vehicle Electrical System Control Module -J519-. Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return, the repair is complete. ♦ Return vehicle to customer.

3.6.13 Fuel Injectors, Checking

General Description

The Fuel Injectors are controlled by the Engine/Motor Control Module -J623- and are mounted normally in the cylinder head. The fuel injectors spray high-pressure atomized fuel directly into the combustion chamber.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.
- ♦ LED Test Lamp.

Test requirements

- Fuses OK.
- Battery voltage OK.

- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 695 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Harness connector from suspect Fuel Injector. • CHECK: Suspect Fuel Injector component connector terminals 1 to 2 for resistance (refer to appropriate wiring diagram for correct terminal and connector locations). • SPECIFIED VALUE: 0.5 – 15 Ω (@ approx. 20° C). – Was Value obtained?	– YES: ♦ For 1K2 (from July 2009): GO TO: Step 3 ⇒ page 695 . ♦ For all others: GO TO: Step 4 ⇒ page 695 . – NO: ♦ REPLACE: Suspect Fuel Injector(s). Refer to appropriate repair manual. ♦ GO TO: Step 5 ⇒ page 696 .
3	• IGNITION: ON. • CHECK: Suspect Fuel Injector harness connector terminal 1 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Was Value obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 695 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 696 .
4	• REMOVE: Engine/Motor Control Module - J623-. Refer to appropriate repair manual. • For all others: CHECK: Suspect Fuel Injector harness connector terminal 1 to the Engine/Motor Control Module - J623- harness connector T60 / xx for resistance (refer to appropriate wiring diagram for correct terminal and connector locations). • CHECK: Suspect Fuel Injector harness connector terminal 2 to the Engine/Motor Control Module - J623- harness connector T60 / xx for resistance (refer to appropriate wiring diagram for correct terminal and connector locations). • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ TIP: The Fuel Injector may fail under loaded operation; please swap a known good Fuel Injector prior to continuing to the next step. ♦ GO TO: Step 5 ⇒ page 696 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 696 .

Step	Procedure	Result / Action to Take
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.14 Ignition Coils With Power Output Stage, Checking

General Description

The ignition coil must transform the relatively low 12 V on-board vehicle voltage to the high ignition voltage required and supply the energy stored in that voltage to the spark plug. The functional principle of the ignition coil is relatively simple. It has a primary winding (small number of turns) and a secondary winding (lots of turns). The turn ratio between the number of primary and secondary winding turns determines the level of the voltage generated at the output. The Ignition Coils With Power Output Stage are plugged directly into the spark plug. This means the ignition energy can be transferred directly to the spark plug with virtually zero power loss.

Special tools and workshop equipment required

◆ Multimeter.

◆ Wiring Diagram.

◆ Scan Tool.

◆ LED Test Lamp.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions", page 2 .

- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 697 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Suspect Ignition Coil With Power Output Stage harness connector. • IGNITION: ON. • CHECK: Suspect Ignition Coil With Power Output Stage harness connector terminals 1 to 2 and 4 for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Were Values obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 697 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 698 .
3	• REMOVE: Engine/Motor Control Module - J623-. Refer to appropriate repair manual. • CHECK: Suspect Ignition Coil With Power Output Stage harness connector terminal 3 to the Engine/Motor Control Module - J623- harness connector T60 / xx for resistance (refer to appropriate wiring diagram for correct terminal and connector locations). • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 697 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 698 .
4	• DISCONNECT: All of the Fuel Injectors (refer to appropriate wiring diagram for correct terminal and connector locations). • DISCONNECT: Cold Start Injector (If applicable). • CONNECT: Engine/Motor Control Module - J623- harness connectors. • CONNECT: LED Test Lamp to Suspect Ignition Coil With Power Output Stage harness connector terminals 3 to 2. • CRANK: Engine. • SPECIFIED VALUE: LED Test Lamp should Flicker ON & OFF. – Was Value obtained?	– YES: ♦ REPLACE: Ignition Coil With Power Output Stage. Refer to appropriate repair manual. ♦ GO TO: Step 5 ⇒ page 698 . – NO: ♦ GO TO: Step 5 ⇒ page 698 .

Step	Procedure	Result / Action to Take
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return, the repair is complete. ♦ Return vehicle to customer.

3.6.15 Intake Manifold Sensor - GX9-, Checking

General Description

The air mass and charge pressure are two factors used for engine load management. For this purpose, there are several sensors with absolutely identical functions. They measure the intake air temperature and the intake manifold pressure. The first sender unit is located upstream of the Throttle Valve Control Module -J338/GX3- in the Intake Manifold Sensor -GX9-. They measure the pressure and temperature of the air in each individual cylinder bank. The values measured here correspond to the actual air mass in the cylinder bank(s).

The Intake Manifold Sensor -GX9- contains the following components:

♦ Intake Air Temperature Sensor -G42-.

♦ Manifold Absolute Pressure Sensor -G71-.

The Intake Manifold Sensor -GX9- components cannot be serviced separately, and they must be serviced as a unit.

Special tools and workshop equipment required

♦ Multimeter.

♦ Wiring Diagram.

♦ Scan Tool.

Test requirements

• Fuses OK.

• Battery voltage OK.

• Switch OFF all electrical and electronic accessories.

• Vehicles with automatic transmission, ensure the selector lever position is in "P".

- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 699 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Intake Manifold Sensor -GX9- harness connector. • IGNITION: ON. • CHECK: Intake Manifold Sensor -GX9- harness connector terminals 1 to 3 for voltage. • IGNITION: OFF. • SPECIFIED VALUE: About 5.0 V. – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 699 . – NO: ◆ GO TO: Step 4 ⇒ page 699 .
3	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • CHECK: Intake Manifold Sensor -GX9- harness connector terminal 2 to the Engine/Motor Control Module - J623- harness connector T60 / 42 for resistance. • CHECK: Intake Manifold Sensor -GX9- harness connector terminal 4 to the Engine/Motor Control Module - J623- harness connector T60 / 56 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ REPLACE: Intake Manifold Sensor -GX9-. Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 700 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 700 .
4	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • CHECK: Intake Manifold Sensor -GX9- harness connector terminal 1 to the Engine/Motor Control Module - J623- harness connector T60 / 13 for resistance. • CHECK: Intake Manifold Sensor -GX9- harness connector terminal 3 to the Engine/Motor Control Module - J623- harness connector T60 / 44 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ GO TO: Step 5 ⇒ page 700 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 700 .

Step	Procedure	Result / Action to Take
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.16 Knock Sensor 1 - G61-, Checking

General Description

The Knock Sensor 1 -G61- is a tuned accelerometer on the engine which converts engine vibration to an electrical signal. The Engine/Motor Control Module -J623- uses this signal to determine the presence of engine knock and to retard spark timing, if necessary.

Special tools and workshop equipment required

- ◆ Multimeter.
- ◆ Wiring Diagram.
- ◆ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions", page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions", page 4 .

Test Procedure

Note

- *Prior to beginning the test procedure, make sure to check the items listed below:*
- *Poor fuel quality*
- *Ignition timing malfunction*
- *Loose components on the engine block*
- *Engine temperature must be in the normal range*

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck", page 14 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 701 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • CONNECT: Scan tool. • START: Engine and let Idle. • CHECK: The ignition advance timing value. • TAP: Near the Knock Sensor 1 -G61- area and monitor for any fluctuations in the ignition timing advance value. • IGNITION: OFF. • SPECIFIED VALUE: 1 - 10 degrees of ignition timing fluctuation. – Was Value obtained?	– YES: ◆ CONDITION: May be intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 702 . – NO: ◆ GO TO: Step 3 ⇒ page 702 .

Step	Procedure	Result / Action to Take
3	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • DISCONNECT: Knock Sensor 1 -G61- harness connector. • CHECK: Knock Sensor 1 -G61- harness connector terminal 1 to the Engine/Motor Control Module - J623- harness connector T60 / 8 for resistance. • CHECK: Knock Sensor 1 -G61- harness connector terminal 2 to the Engine/Motor Control Module - J623- harness connector T60 / 9 for resistance. • 1K2, 162 (from Apr 2010 to Nov 2010), AJ5 (from Jul 2009 to Jun 2011), 5K1 (from May 2009 to Oct 2011), A32: CHECK: Knock Sensor 1 -G61- harness connector terminal 3 to the Engine/Motor Control Module - J623- harness connector T60 / 13 for resistance. • 162 (from Dec 2010), AJ5 (from Jul 2011), 5K1 (from Nov 2011): CHECK: Knock Sensor 1 -G61- harness connector terminal 3 to the Engine/Motor Control Module - J623- harness connector T60 / 24 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ TIP: The Knock Sensor 1 -G61- may fail under loaded operation; please swap a known good Knock Sensor 1 -G61- prior to continuing to the next step. ♦ GO TO: Step 4 ⇒ page 702 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 4 ⇒ page 702 .
4	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return, the repair is complete. ♦ Return vehicle to customer.

3.6.17 Knock Sensor 2 - G66-, Checking

General Description

The Knock Sensor 2 -G66- is a tuned accelerometer on the engine which converts engine vibration to an electrical signal. The Engine/Motor Control Module -J623- uses this signal to determine the presence of engine knock and to retard spark timing, if necessary.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Note

- ♦ *Prior to beginning the test procedure, make sure to check the items listed below:*
- ♦ *Poor fuel quality*
- ♦ *Ignition timing malfunction*
- ♦ *Loose components on the engine block*
- ♦ *Engine temperature must be in the normal range*

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ G3.1 heck”, page 14 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 703 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • CONNECT: Scan tool. • START: Engine and let Idle. • CHECK: The ignition advance timing value. • TAP: Near the Knock Sensor 2 -G66- area and monitor for any fluctuations in the ignition timing advance value. • IGNITION: OFF. • SPECIFIED VALUE: 1 – 10 degrees of ignition timing fluctuation. – Was Value obtained?	– YES: ♦ CONDITION: May be intermittent. ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 4 ⇒ page 704 . – NO: ♦ GO TO: Step 3 ⇒ page 704 .

Step	Procedure	Result / Action to Take
3	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • DISCONNECT: Knock Sensor 2 -G66- harness connector. • CHECK: Knock Sensor 2 -G66- harness connector terminal 1 to the Engine/Motor Control Module - J623- harness connector T60 / 10 for resistance. • CHECK: Knock Sensor 2 -G66- harness connector terminal 2 to the Engine/Motor Control Module - J623- harness connector T60 / 11 for resistance. • 1K2, 162 (from Apr 2010 to Nov 2010), AJ5 (from Jul 2009 to Jun 2011), 5K1 (from May 2009 to Oct 2011), A32: CHECK: Knock Sensor 2 -G66- harness connector terminal 3 to the Engine/Motor Control Module - J623- harness connector T60 / 13 for resistance. • 162 (from Dec 2010), AJ5 (from Jul 2011), 5K1 (from Nov 2011): CHECK: Knock Sensor 2 -G66- harness connector terminal 3 to the Engine/Motor Control Module - J623- harness connector T60 / 23 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ TIP: The Knock Sensor 2 -G66- may fail under loaded operation; please swap a known good Knock Sensor 2 -G66- prior to continuing to the next step. ◆ GO TO: Step 4 ⇒ page 704 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 704 .
4	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.18 Leak Detection Pump - V144-, Checking (3 Pin)

General Description

Whenever the engine is running, vacuum is applied to the Vacuum Switch. This switch applies vacuum to the Upper Chamber of the pump when it receives a ground signal from the Engine/Motor Control Module -J623-. This signal is a duty cycle pulse of approximately 40%. When vacuum is applied to the

Upper Chamber, fresh air flows in through the One-way Inlet Valve, compressing the spring above the diaphragm. When the Diaphragm begins to rise, the Reed Switch, attached to the Diaphragm Rod, opens. When the Vacuum Switch closes, the vacuum in the Upper Chamber is released. As a result, the spring pushes the Diaphragm down. As the Diaphragm is pushed down, the air in the Lower Chamber is pushed out of the One-way Outlet Valve into the EVAP system. This process continues until the pressure in the EVAP system no longer allows the spring to push the Diaphragm down. With tension on the Diaphragm, the ECM waits for a certain period of time to watch for the Diaphragm to fall. The Reed Switch closing signals that the Diaphragm has fallen to its lowest point. When the Reed Switch closes, the ECM may cycle the LDP to build up system pressure again. The ECM measures the time it takes for the Reed Switch to close once the Leak Detection Pump -V144- has stopped running to determine if there is a leak in the system. The slower the Diaphragm falls after the pump stops running, the less air is leaking out of the EVAP system.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.
- ♦ Hand Vacuum Pump.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 705 . – NO: ♦ GATHER more information from customer about the complaint.
2	• REMOVE: Evaporative Canister. Refer to appropriate repair manual. • Plug or Cap off the Leak Detection Pump -V144- port going to the vent filter. • CONNECT: Hand vacuum pump to the Leak Detection Pump - V144- CAN port and apply 0.700 bar and see if the vacuum holds. – Did the vacuum hold?	– YES: ♦ GO TO Step 3 ⇒ page 706 . – NO: ♦ REPLACE: Leak Detection Pump - V144-. Refer to appropriate repair manual. ♦ GO TO: Step 5 ⇒ page 706 .

Step	Procedure	Result / Action to Take
3	• IGNITION: OFF. • DISCONNECT: Leak Detection Pump -V144- harness connector. • IGNITION: ON. • CHECK: Leak Detection Pump -V144- harness connector terminal 3 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Was Value obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 706 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 706 .
4	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • CHECK: Leak Detection Pump -V144- harness connector terminal 1 to the Engine/Motor Control Module -J623- harness connector T94 / 64 for resistance. • CHECK: Leak Detection Pump -V144- harness connector terminal 2 to the Engine/Motor Control Module -J623- harness connector T94 / 25 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ REPLACE: Leak Detection Pump -V144-. Refer to appropriate repair manual. ♦ GO TO: Step 5 ⇒ page 706 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 706 .
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return, the repair is complete. ♦ Return vehicle to customer.

3.6.19 Leak Detection Pump - V144-, Checking (4 Pin)

General Description

Whenever the engine is running, vacuum is applied to the Vacuum Switch. This switch applies vacuum to the Upper Chamber of the pump when it receives a ground signal from the Engine/Motor Control Module -J623-. This signal is a duty cycle

pulse of approximately 40%. When vacuum is applied to the Upper Chamber, fresh air flows in through the One-way Inlet Valve, compressing the spring above the diaphragm. When the Diaphragm begins to rise, the Reed Switch, attached to the Diaphragm Rod, opens. When the Vacuum Switch closes, the vacuum in the Upper Chamber is released. As a result, the spring pushes the Diaphragm down. As the Diaphragm is pushed down, the air in the Lower Chamber is pushed out of the One-way Outlet Valve into the EVAP system. This process continues until the pressure in the EVAP system no longer allows the spring to push the Diaphragm down. With tension on the Diaphragm, the ECM waits for a certain period of time to watch for the Diaphragm to fall. The Reed Switch closing signals that the Diaphragm has fallen to its lowest point. When the Reed Switch closes, the ECM may cycle the LDP to build up system pressure again. The ECM measures the time it takes for the Reed Switch to close once the Leak Detection Pump -V144- has stopped running to determine if there is a leak in the system. The slower the Diaphragm falls after the pump stops running, the less air is leaking out of the EVAP system.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.
- ♦ Hand Vacuum Pump.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 707 . – NO: ♦ GATHER more information from customer about the complaint.
2	• REMOVE: Evaporative Canister. Refer to appropriate repair manual. • Plug or Cap off the Leak Detection Pump - V144- port going to the vent filter. • CONNECT: Hand vacuum pump to the Leak Detection Pump - V144- CAN port and apply 0.700 bar and see if the vacuum holds. – Did the vacuum hold?	– YES: ♦ GO TO Step 3 ⇒ page 708 . – NO: ♦ REPLACE: Leak Detection Pump - V144-. Refer to appropriate repair manual. ♦ GO TO: Step 5 ⇒ page 708 .

Step	Procedure	Result / Action to Take
3	• IGNITION: OFF. • DISCONNECT: Leak Detection Pump -V144- harness connector. • IGNITION: ON. • CHECK: Leak Detection Pump -V144- harness connector terminal 4 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 708 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 708 .
4	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • CHECK: Leak Detection Pump -V144- harness connector terminal 1 to the Engine/Motor Control Module -J623- harness connector T94 / 28 for resistance. • CHECK: Leak Detection Pump -V144- harness connector terminal 2 to the Engine/Motor Control Module -J623- harness connector T94 / 25 for resistance. • CHECK: Leak Detection Pump -V144- harness connector terminal 3 to the Engine/Motor Control Module -J623- harness connector T94 / 9 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ REPLACE: Leak Detection Pump -V144-. Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 708 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 708 .
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.20 Motronic Engine Control Module Power Supply Relay - J271-, Checking

General Description

The following procedure is used to diagnose the Motronic Engine Control Module Power Supply Relay -J271- and the Engine/Motor Control Module -J623- power supply voltage that is provided by the Motronic Engine Control Module Power Supply Relay -J271-.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 709 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Motronic Engine Control Module Power Supply Relay -J271- from the Fuse Panel B -SB- in the engine compartment (refer to appropriate wiring diagram). • IGNITION: ON. • 5K1 (from May 2009): CHECK: Motronic Engine Control Module Power Supply Relay -J271- socket terminals 30 and 85 to ground for voltage. • All others: CHECK: Motronic Engine Control Module Power Supply Relay -J271- socket terminals 30 and 86 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Were Values obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 710 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 711 .

Step	Procedure	Result / Action to Take
3	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • CONNECT: Jumper wire, between the Motronic Engine Control Module Power Supply Relay -J271- socket terminals 30 and 87. • IGNITION: ON. • CHECK: Engine/Motor Control Module -J623- harness connector T94 / 3 and T94 / 5 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Were Values obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 710 . – NO: ◆ GO TO: Step 5 ⇒ page 710 .
4	• REMOVE: Jumper wire, between the Motronic Engine Control Module Power Supply Relay -J271- socket terminals 30 and 87. • 5K1 (from May 2009): CHECK: Motronic Engine Control Module Power Supply Relay -J271- socket terminal 86 to the Engine/Motor Control Module -J623- harness connector T94 / 69 for resistance. • All others: CHECK: Motronic Engine Control Module Power Supply Relay -J271- socket terminal 85 to the Engine/Motor Control Module -J623- harness connector T94 / 69 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ REPLACE: Motronic Engine Control Module Power Supply Relay -J271-. Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 711 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 711 .
5	• REMOVE: Jumper wire, between the Motronic Engine Control Module Power Supply Relay -J271- socket terminals 30 and 87. • REMOVE: Appropriate fuse (refer to appropriate wiring diagram for correct fuse). • CHECK: Downstream (output) side of Appropriate fuse to the Engine/Motor Control Module -J623- harness connector T94 / 3 and T94 / 5 for resistance (refer to appropriate wiring diagram for correct fuse). • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ REPLACE: Fuse panel. Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 711 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 711 .

Step	Procedure	Result / Action to Take
6	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.21 Outside Air Temperature Sensor - G17-, Checking

General Description

The ambient or Outside Air Temperature Sensor -G17- is a negative temperature coefficient (NTC) sensor that informs the semiautomatic / automatic temperature control system of outside air temperature. An NTC sensor resistance decreases as the temperature increases, and the sensor resistance increases as the temperature decreases. The computer uses this input along with different in-car temperature sensors to control temperature and blower speed. When there is a problem with this sensor, performance will suffer and the A/C compressor clutch may not engage.

Note

The connector called out in this pinpoint is T32 in some of the vehicles and T32c in others. For simplicity, T32 only is used.

Special tools and workshop equipment required

◆ Multimeter.

◆ Wiring Diagram.

◆ Scan Tool.

Test requirements

• Fuses OK.

• Battery voltage OK.

• Switch OFF all electrical and electronic accessories.

• Vehicles with automatic transmission, ensure the selector lever position is in "P".

- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 712 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Outside Air Temperature Sensor -G17- harness connector. • CHECK: Outside Air Temperature Sensor -G17- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 1,300 Ω (+/- 500 Ω @ approx. 20° C). – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 712 . – NO: ♦ REPLACE: Outside Air Temperature Sensor -G17-. Refer to appropriate repair manual. ♦ GO TO: Step 4 ⇒ page 713 .
3	• REMOVE: Instrument Cluster Control Module -J285-. Refer to appropriate repair manual. • CHECK: Outside Air Temperature Sensor -G17- harness connector terminal 1 to the Instrument Cluster Control Module -J285- harness connector T32 / 20 for resistance. • CHECK: Outside Air Temperature Sensor -G17- harness connector terminal 2 to the Instrument Cluster Control Module -J285- harness connector T32 / 19 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ TIP: The Outside Air Temperature Sensor -G17- may fail under loaded operation; please swap a known good Outside Air Temperature Sensor -G17- prior to continuing to the next step. ♦ GO TO: Step 4 ⇒ page 713 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 4 ⇒ page 713 .

Step	Procedure	Result / Action to Take
4	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Instrument Cluster Control Module -J285- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Instrument Cluster Control Module -J285-. Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return, the repair is complete. ♦ Return vehicle to customer.

3.6.22 Oxygen Sensor 1 After Catalytic Converter - GX7-, Checking

General Description

The Oxygen Sensor 1 After Catalytic Converter -GX7- is positioned downstream of the primary catalytic converter and it supplies the Engine/Motor Control Module -J623- with a voltage signal (nonlinear) indicating a "rich" or a "lean" condition is present. If the primary catalytic converter is supersaturated with oxygen (indicating a lean mixture is present), the Oxygen Sensor 1 After Catalytic Converter -GX7- will send the Engine/Motor Control Module -J623- a nonlinear signal indicating the lean mixture condition. The mixture is then enriched with fuel until the oxygen has been "displaced" from the catalytic converter. This new condition, in turn, is registered by the Oxygen Sensor 1 After Catalytic Converter -GX7- as a nonlinear signal indicating the rich mixture condition. The mixture is then leaned out by the Engine/Motor Control Module -J623-. If the nonlinear signal is received again, the mixture will again be enriched. The frequency, or period, during which the mixture is enriched or leaned out is variable, being dependent on the gas flow rate (engine load) at that moment.

Note the Oxygen Sensor 1 After Catalytic Converter -GX7- is also known as the Oxygen Sensor After Three Way Catalytic Converter -G130-.

The Oxygen Sensor 1 After Catalytic Converter -GX7- contains the following components:

♦ Oxygen Sensor After Three Way Catalytic Converter -G130-.

♦ Heater For Oxygen Sensor 1 After Catalytic Converter -Z29-.

The Oxygen Sensor 1 After Catalytic Converter -GX7- components cannot be serviced separately, and they must be serviced as a unit.

Special tools and workshop equipment required

- Multimeter.
- Wiring Diagram.
- Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to Oxygen Sensor Preliminary Tests in ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 714 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Oxygen Sensor 1 After Catalytic Converter -GX7- harness connector. • CHECK: Oxygen Sensor 1 After Catalytic Converter -GX7- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 2 – 4 Ω (+/- 0.5 Ω @ 25° C). – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 714 . – NO: ♦ REPLACE: Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to appropriate repair manual. ♦ GO TO: Step 6 ⇒ page 715 .
3	• IGNITION: ON. • CHECK: Oxygen Sensor 1 After Catalytic Converter -GX7- harness connector terminal 1 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Was Value obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 715 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 715 .

Step	Procedure	Result / Action to Take
4	• RECONNECT: Oxygen Sensor 1 After Catalytic Converter -GX7- harness connector. • CONNECT: Scan Tool. • START: Engine and let Idle. • Perform the function test located in diagnostic mode 06. Refer to appropriate Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions, ⇒ M3.3 odes 01 – 0A", page 17 . • IGNITION: OFF. • SPECIFIED VALUE: Mode 6 Pass. – Were Values obtained?	– YES: ◆ FAULT: Is intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 715 . – NO: ◆ GO TO: Step 5 ⇒ page 715 .
5	• DISCONNECT: Oxygen Sensor 1 After Catalytic Converter -GX7- harness connector. • REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • CHECK: Oxygen Sensor 1 After Catalytic Converter -GX7- harness connector terminal 2 to the Engine/Motor Control Module -J623- harness connector T94 / 7 for resistance. • CHECK: Oxygen Sensor 1 After Catalytic Converter -GX7- harness connector terminal 3 to the Engine/Motor Control Module -J623- harness connector T94 / 72 for resistance. • CHECK: Oxygen Sensor 1 After Catalytic Converter -GX7- harness connector terminal 4 to the Engine/Motor Control Module -J623- harness connector T94 / 84 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ REPLACE: Oxygen Sensor 1 After Catalytic Converter -GX7-. Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 715 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 715 .
6	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.23 Oxygen Sensor 1 Before Catalytic Converter - GX10-, Checking

General Description

The Oxygen Sensor 1 Before Catalytic Converter -GX10- does not actually measure oxygen concentration, but rather the difference between the amount of oxygen in the exhaust gas and the amount of oxygen in the air. A rich mixture causes an oxygen demand. This demand causes a voltage to build up, due to transportation of oxygen ions through the Oxygen Sensor 1 Before Catalytic Converter -GX10- layer. A lean mixture causes a low voltage, since there is an oxygen excess. The Oxygen Sensor 1 Before Catalytic Converter -GX10- and catalytic converters are used in order to reduce exhaust emissions. Information on oxygen concentration is sent to the Engine/Motor Control Module -J623-, which adjusts the amount of fuel injected into the engine to compensate for excess air or excess fuel. The Engine/Motor Control Module -J623- attempts to maintain, on average, a certain air–fuel ratio by interpreting the information it gains from the Oxygen Sensor 1 Before Catalytic Converter -GX10-. The primary goal is a compromise between power, fuel economy, and emissions. The heater for the Oxygen Sensor 1 Before Catalytic Converter -GX10- is designed to minimize the time-to-readiness for closed-loop operation by heating the Oxygen Sensor 1 Before Catalytic Converter -GX10- as quickly as possible.

The Oxygen Sensor 1 Before Catalytic Converter -GX10- contains the following components:

- ♦ Heated Oxygen Sensor -G39-.
- ♦ Oxygen Sensor Heater -Z19-.

The Oxygen Sensor 1 Before Catalytic Converter -GX10- components cannot be serviced separately, and they must be serviced as a unit.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to Oxygen Sensor Preliminary Tests in ⇒ C3.1 heck", page 14 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 717 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Oxygen Sensor 1 Before Catalytic Converter -GX10- harness connector. • CHECK: Oxygen Sensor 1 Before Catalytic Converter -GX10- component connector terminals 3 to 4 for resistance. • SPECIFIED VALUE: 2 – 4 Ω (+/- 0.5 Ω @ 25° C). – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 717 . – NO: ◆ REPLACE: Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 718 .
3	• IGNITION: ON. • CHECK: Oxygen Sensor 1 Before Catalytic Converter -GX10- harness connector terminal 4 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 717 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 718 .
4	• RECONNECT: Oxygen Sensor 1 Before Catalytic Converter -GX10- harness connector. • CONNECT: Scan Tool. • START: Engine and let Idle. • Perform the function test located in diagnostic mode 06. Refer to appropriate Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions, ⇒ M3.3 odes 01 – 0A", page 17 . • IGNITION: OFF. • SPECIFIED VALUE: Mode 6 Pass. – Were Values obtained?	– YES: ◆ FAULT: Is intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 718 . – NO: ◆ GO TO: Step 5 ⇒ page 718 .

Step	Procedure	Result / Action to Take
5	• DISCONNECT: Oxygen Sensor 1 Before Catalytic Converter -GX10- harness connector. • REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • CHECK: Oxygen Sensor 1 Before Catalytic Converter -GX10- harness connector terminal 1 to the Engine/Motor Control Module -J623- harness connector T94 / 78 for resistance. • CHECK: Oxygen Sensor 1 Before Catalytic Converter -GX10- harness connector terminal 2 to the Engine/Motor Control Module -J623- harness connector T94 / 79 for resistance. • CHECK: Oxygen Sensor 1 Before Catalytic Converter -GX10- harness connector terminal 3 to the Engine/Motor Control Module -J623- harness connector T94 / 73 for resistance. • CHECK: Oxygen Sensor 1 Before Catalytic Converter -GX10- harness connector terminal 5 to the Engine/Motor Control Module -J623- harness connector T94 / 56 for resistance. • CHECK: Oxygen Sensor 1 Before Catalytic Converter -GX10- harness connector terminal 6 to the Engine/Motor Control Module -J623- harness connector T94 / 57 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ REPLACE: Oxygen Sensor 1 Before Catalytic Converter -GX10-. Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 718 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 718 .
6	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ◆ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ◆ REPAIR: As necessary. ◆ If all electrical connections are OK: ◆ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ◆ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ◆ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ◆ Return vehicle to Customer. – NO: ◆ Perform the diagnostic procedure for any DTC's. ◆ If no DTC's return, the repair is complete. ◆ Return vehicle to customer.

3.6.24 Secondary Air Injection Pump Relay - J299- / Secondary Air Injection Pump Motor - V101-, Checking

General Description

The secondary air injection system injects air into the exhaust using passages in the cylinder head. This extra air injection takes place using the Secondary Air Injection Pump Motor - V101- that is powered by the Secondary Air Injection Pump Relay -J299- on a cold-start of the engine for about 45 – 100 s and serves to quickly heat the catalytic converter(s) for improved emissions.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Note

The engine MUST be cold (room temperature) in order for the ECM to command the air pump relay ON. The pump runs for approximately 20 – 100 seconds. Once the engine has been started, the ECM may not command the pump to run again for approx 6-8 hrs of engine off time. Due to potential damage to the catalyst, the generic scan tool has no provision for SAI relay control.

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 720 . – NO: ♦ GATHER more information from customer about the complaint.

Step	Procedure	Result / Action to Take
2	• IGNITION: OFF. • REMOVE: Secondary Air Injection Pump Relay -J299- from fuse box. Refer to appropriate repair manual. • IGNITION: ON. • 162 (from Apr 2010): CHECK: Secondary Air Injection Pump Relay -J299- socket terminals 30 and 85 to ground for voltage. • All others: CHECK: Secondary Air Injection Pump Relay -J299- socket terminals 30 and 86 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Were Values obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 720 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 721 .
3	• CONNECT: Jumper wire, between the Secondary Air Injection Pump Relay -J299- socket terminals 30 and 87. • IGNITION: ON. • SPECIFIED VALUE: Secondary Air Injection Pump Motor -V101- should be heard running. • IGNITION: OFF. – Was Value obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 720 . – NO: ♦ GO TO: Step 5 ⇒ page 720 .
4	• DISCONNECT: Jumper wire, between the Secondary Air Injection Pump Relay -J299- socket terminals 30 and 87. • REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • 162 (from Apr 2010): CHECK: Secondary Air Injection Pump Relay -J299- socket terminal 86 to the Engine/Motor Control Module -J623- harness connector T94 / 94 for resistance. • All others: CHECK: Secondary Air Injection Pump Relay -J299- socket terminal 85 to the Engine/Motor Control Module -J623- harness connector T94 / 94 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ♦ REPLACE: Secondary Air Injection Pump Relay -J299-. Refer to appropriate repair manual. ♦ GO TO: Step 6 ⇒ page 721 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 721 .
5	• DISCONNECT: Jumper wire, between the Secondary Air Injection Pump Relay -J299- socket terminals 30 and 87. • DISCONNECT: Secondary Air Injection Pump Motor -V101- harness connector. • CHECK: Secondary Air Injection Pump Relay -J299- socket terminal 87 to the Secondary Air Injection Pump Motor -V101- harness connector terminal 2 for resistance. • CHECK: Secondary Air Injection Pump Motor -V101- harness connector terminal 1 to ground for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ REPLACE: Secondary Air Injection Pump Motor -V101-. Refer to appropriate repair manual. ♦ GO TO: Step 6 ⇒ page 721 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 721 .

Step	Procedure	Result / Action to Take
6	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return, the repair is complete. ♦ Return vehicle to customer.

3.6.25 Secondary Air Injection Sensor 1 -G609-, Checking

General Description

The secondary air injection system injects air into the exhaust on a cold-start of the engine for 45 – 100 s and serves to quickly heat the catalytic converter(s) for improved emissions. A pressure based secondary air diagnostic function is used. In this system, the signal from the Secondary Air Injection Sensor 1 -G609- is evaluated by the Engine/Motor Control Module -J623-. The injected air quantity is determined from the pressure level.

Special tools and workshop equipment required

♦ Multimeter.

♦ Wiring Diagram.

♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in "P".
- Vehicles with manual transmission, ensure the shifter lever position is in "N" with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions", page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions", page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck", page 14 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 722 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Secondary Air Injection Sensor 1 -G609- harness connector. • IGNITION: ON. • CHECK: Secondary Air Injection Sensor 1 -G609- harness connector terminals 1 to 3 for voltage. • IGNITION: OFF. • SPECIFIED VALUE: About 5.0 V. – Was Value obtained?	– YES: ◆ GO TO: Step 3 ⇒ page 722 . – NO: ◆ GO TO: Step 4 ⇒ page 723 .
3	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • 1K2, 162 (early build from Apr 2010), AJ5 (to Jun 2012), 5K1, A32 (to Nov 2011): CHECK: Secondary Air Injection Sensor 1 -G609- harness connector terminal 4 to the Engine/Motor Control Module -J623- harness connector T60 / 55 for resistance. • 162 (2011 late build), AJ5 (from Jul 2012), A32 (from Nov 2011): CHECK: Secondary Air Injection Sensor 1 -G609- harness connector terminal 2 to the Engine/Motor Control Module -J623- harness connector T60 / 55 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ◆ REPLACE: Secondary Air Injection Sensor 1 -G609-. Refer to appropriate repair manual. ◆ GO TO: Step 5 ⇒ page 723 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 5 ⇒ page 723 .

Step	Procedure	Result / Action to Take
4	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • 1K2, 162 (early build from Apr 2010), AJ5 (to Jun 2012), 5K1, A32 (to Nov 2011): CHECK: Secondary Air Injection Sensor 1 -G609- harness connector terminal 1 to the Engine/Motor Control Module -J623- harness connector T60 / 13 for resistance. • 1K2, 162 (early build from Apr 2010), AJ5 (to Jun 2012), 5K1, A32 (to Nov 2011): CHECK: Secondary Air Injection Sensor 1 -G609- harness connector terminal 3 to the Engine/Motor Control Module -J623- harness connector T60 / 44 for resistance. • 162 (2011 late build), AJ5 (from Jul 2012), A32 (from Nov 2011): CHECK: Secondary Air Injection Sensor 1 -G609- harness connector terminal 1 to the Engine/Motor Control Module -J623- harness connector T60 / 44 for resistance. • 162 (2011 late build), AJ5 (from Jul 2012), A32 (from Nov 2011): CHECK: Secondary Air Injection Sensor 1 -G609- harness connector terminal 3 to the Engine/Motor Control Module -J623- harness connector T60 / 13 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ GO TO: Step 5 ⇒ page 723 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 723 .
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ♦ Clear the DTC’s. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory”, page 22 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode”, page 15 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC’s. ♦ If no DTC’s return, the repair is complete. ♦ Return vehicle to customer.

3.6.26 Secondary Air Injection Solenoid Valve - N112-, Checking

General Description

The secondary air injection system injects air into the exhaust on a cold-start of the engine for about 45 – 100 s. and serves to

quickly heat the catalytic converter(s) for improved emissions. A "pressure based secondary air diagnostics" function is used. In this system, the Engine/Motor Control Module -J623- controls the Secondary Air Injection Solenoid Valve -N112-, which allows the air quantity necessary to be injected into the exhaust.

Special tools and workshop equipment required

- Multimeter.
- Wiring Diagram.
- Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 724 . – NO: ♦ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • DISCONNECT: Secondary Air Injection Solenoid Valve -N112- harness connector. • CHECK: Secondary Air Injection Solenoid Valve -N112- component connector terminals 1 to 2 for resistance. • SPECIFIED VALUE: 5 – 35 Ω (@ approx. 20° C). – Was Value obtained?	– YES: ♦ GO TO: Step 3 ⇒ page 724 . – NO: ♦ REPLACE: Secondary Air Injection Solenoid Valve -N112-. Refer to appropriate repair manual. ♦ GO TO: Step 5 ⇒ page 725 .
3	• IGNITION: ON. • CHECK: Secondary Air Injection Solenoid Valve -N112- harness connector terminal 1 to ground for voltage. • IGNITION: OFF. • SPECIFIED VALUE: Battery voltage. – Was Value obtained?	– YES: ♦ GO TO: Step 4 ⇒ page 725 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 725 .

Step	Procedure	Result / Action to Take
4	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • 5K1: CHECK: Secondary Air Injection Solenoid Valve -N112- harness connector terminal 2 to the Engine/Motor Control Module -J623- harness connector T94 / 48 for resistance. • All others: CHECK: Secondary Air Injection Solenoid Valve -N112- harness connector terminal 2 to the Engine/Motor Control Module -J623- harness connector T60 / 48 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Was Value obtained?	– YES: ♦ TIP: The Secondary Air Injection Solenoid Valve -N112- may fail under loaded operation; please swap a known good Secondary Air Injection Solenoid Valve -N112- prior to continuing to the next step. ♦ GO TO: Step 5 ⇒ page 725 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 5 ⇒ page 725 .
5	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ♦ Clear the DTC’s. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory”, page 22 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode”, page 15 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC’s. ♦ If no DTC’s return, the repair is complete. ♦ Return vehicle to customer.

3.6.27 Three Way Catalytic Converter (TWC), Checking

General Description

A catalytic converter is a vehicle emissions control device that converts toxic pollutants in exhaust gas to less toxic pollutants by catalyzing a redox reaction (oxidation or reduction). Catalytic converters are used in internal combustion engines.

General recommendations

Oxygen sensors OK.

No leaks or damage to exhaust system.

Prior to repair work, perform a preliminary check to verify the condition. Refer to ⇒ C3.1 heck”, page 14 .

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	Activate Monitors: • Perform the function test in Diagnostic Mode 06. Refer to appropriate Diagnostic Mode 06 - Read Test Results for Specific Diagnostic Functions, ⇒ M3.3 odes 01 – 0A”, page 17 . • End diagnosis and switch the ignition off. • If the specified values are exceeded:	◆ Check the exhaust system for leaks. ◆ If necessary, repair the leak(s) in the exhaust system. ◆ GO TO: Step 2 ⇒ page 726 .
2	O2 Sensor Monitoring: • Erase the DTC memory. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory”, page 22 . • Perform a road test to verify repair. • If the DTC does not return:	◆ Generate readiness code. Refer to ⇒ C3.2 ode”, page 15 . ◆ If no leaks are found in the exhaust system: ◆ Replace the catalytic converter with front exhaust pipe. Refer to appropriate repair manual. ◆ GO TO: Step 3 ⇒ page 726 .
3	• Final procedure: • Perform a road test to verify repair.	• After the repair work, the following work steps must be performed in the following sequence: • Check the DTC memory. Refer to ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 . • If necessary, erase the DTC memory. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory”, page 22 . • If the DTC memory was erased, generate readiness code. Refer to ⇒ C3.2 ode”, page 15 . • Return vehicle to Customer.

3.6.28 Throttle Valve Control Module - GX3 / J338-, Checking

General Description

The throttle valve operation occurs by an electric motor identified as the EPC Throttle Drive -G186- located within the Throttle Valve Control Module -GX3-. It is controlled by the Engine/Motor Control Module -J623- with primary inputs from the Accelerator Pedal Module -GX2- as well as other peripheral inputs from the EPC Throttle Drive Angle Sensor 1 -G187- (5K1) or the

Throttle Position Sensor -G69- (all others) and the EPC Throttle Drive Angle Sensor 2 -G188-.

Note the Throttle Valve Control Module -GX3- is also referred to as the Throttle Valve Control Module -J338-.

The Throttle Valve Control Module -GX3 / J338- contains the following components:

- ♦ EPC Throttle Drive -G186-.
- ♦ EPC Throttle Drive Angle Sensor 1 -G187- (5K1).
- ♦ Throttle Position Sensor -G69- (All others).
- ♦ EPC Throttle Drive Angle Sensor 2 -G188-.

The Throttle Valve Control Module -GX3 / J338- components cannot be serviced separately, and they must be serviced as a unit.

Special tools and workshop equipment required

- ♦ Multimeter.
- ♦ Wiring Diagram.
- ♦ Scan Tool.

Test requirements

- Fuses OK.
- Battery voltage OK.
- Switch OFF all electrical and electronic accessories.
- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ♦ GO TO: Step 2 ⇒ page 728 . – NO: ♦ GATHER more information from customer about the complaint.

Step	Procedure	Result / Action to Take
2	• IGNITION: OFF. • CONNECT: Scan Tool. • IGNITION: ON. • CHECK: Throttle valve position closed: • SPECIFIED VALUE: 3 – 25%. • DEPRESS: Accelerator pedal slowly to WOT while observing the percentage display. The percentage display must increase uniformly. • CHECK: Throttle valve position at WOT: • SPECIFIED VALUE: 84 – 97%. • IGNITION: OFF. – Were Values obtained?	– YES: ◆ CONDITION: May be intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 729 . – NO: ◆ GO TO: Step 3 ⇒ page 728 .
3	• REMOVE: Throttle Valve Control Module -GX3- far enough so that the harness connector terminals are accessible. • DISCONNECT: Throttle Valve Control Module - GX3- harness connector. • IGNITION: ON. • CHECK: Throttle Valve Control Module - GX3- harness connector terminals 2 to 6 for voltage. • IGNITION: OFF. • SPECIFIED VALUE: About 5.0 V. – Was Value obtained?	– YES: ◆ GO TO: Step 4 ⇒ page 728 . – NO: ◆ GO TO: Step 5 ⇒ page 729 .
4	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • CHECK: Throttle Valve Control Module - GX3- harness connector terminal 1 to the Engine/Motor Control Module -J623- harness connector T60 / 54 for resistance. • CHECK: Throttle Valve Control Module - GX3- harness connector terminal 3 to the Engine/Motor Control Module -J623- harness connector T60 / 46 for resistance. • CHECK: Throttle Valve Control Module - GX3- harness connector terminal 4 to the Engine/Motor Control Module -J623- harness connector T60 / 41 for resistance. • CHECK: Throttle Valve Control Module - GX3- harness connector terminal 5 to the Engine/Motor Control Module -J623- harness connector T60 / 47 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ◆ REPLACE: Throttle Valve Control Module - GX3-. Refer to appropriate repair manual. ◆ GO TO: Step 6 ⇒ page 729 . – NO: ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 6 ⇒ page 729 .

Step	Procedure	Result / Action to Take
5	• REMOVE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. • CHECK: Throttle Valve Control Module -GX3- harness connector terminal 2 to the Engine/Motor Control Module -J623- harness connector T60 / 12 for resistance. • CHECK: Throttle Valve Control Module -GX3- harness connector terminal 6 to the Engine/Motor Control Module -J623- harness connector T60 / 43 for resistance. • SPECIFIED VALUE: 0.5 Ω (± 0.3 Ω). – Were Values obtained?	– YES: ♦ GO TO: Step 6 ⇒ page 729 . – NO: ♦ PERFORM: Visual Inspection of wiring and component. ♦ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ♦ REPAIR: Faulty wiring or connector. ♦ GO TO: Step 6 ⇒ page 729 .
6	• Final Procedure • Perform a road test to verify repair. – Does the original DTC return?	– YES: ♦ CHECK: Engine/Motor Control Module -J623- harness connector for any damaged, pushed-out pins. ♦ REPAIR: As necessary. ♦ If all electrical connections are OK: ♦ REPLACE: Engine/Motor Control Module -J623-. Refer to appropriate repair manual. ♦ Clear the DTC's. Refer to ⇒ M3.3.4 ode 04 – Erase DTC Memory", page 22 . ♦ Repair is complete. Generate Readiness Code. Refer to ⇒ C3.2 ode", page 15 . ♦ Return vehicle to Customer. – NO: ♦ Perform the diagnostic procedure for any DTC's. ♦ If no DTC's return, the repair is complete. ♦ Return vehicle to customer.

3.6.29 Vehicle Speed Signal, Checking

General Description

The Vehicle Speed Signal or VSS measures Transmission / Transaxle output or Wheel Speed from the ABS. The signal is broadcasted over the CAN Bus. The Engine/Motor Control Module -J623- uses this information to modify engine functions such as ignition timing, A/F ratio, transmission shift points, and to initiate diagnostic routines.

Special tools and workshop equipment required

♦ Multimeter.

♦ Wiring Diagram.

♦ Scan Tool.

Test requirements

• Fuses OK.

• Battery voltage OK.

• Switch OFF all electrical and electronic accessories.

- Vehicles with automatic transmission, ensure the selector lever position is in “P”.
- Vehicles with manual transmission, ensure the shifter lever position is in “N” with the parking brake applied.
- Observe all safety precautions: ⇒ P1.1 recautions”, page 2 .
- View clean working conditions: ⇒ W1.2 orking Conditions”, page 4 .

Test Procedure

Step	Procedure	Result / Action to Take
1	• PERFORM: Preliminary Check to verify the customers complaint. Refer to ⇒ C3.1 heck”, page 14 . – Was Complaint verified?	– YES: ◆ GO TO: Step 2 ⇒ page 730 . – NO: ◆ GATHER more information from customer about the complaint.
2	• IGNITION: OFF. • CONNECT: Scan Tool. • ROAD TEST: Vehicle. • CHECK: Scan Tool to Speedometer for accuracy. • SPECIFIED VALUE: Difference ≤ 10%. – Was Value obtained?	– YES: ◆ CONDITION: May be intermittent. ◆ PERFORM: Visual Inspection of wiring and component. ◆ CHECK: Wiring for open, high resistance, short or harness connector for damage, corrosion, loose or broken terminals. ◆ REPAIR: Faulty wiring or connector. ◆ GO TO: Step 4 ⇒ page 730 . – NO: ◆ GO TO: Step 3 ⇒ page 730 .
3	• CHECK: ABS. • CHECK: ABS DTC’s. – Was the ABS OK?	– YES: ◆ CHECK: CAN Bus wiring from the Instrument Cluster Control Module -J285- to the ABS Control Module -J104-. ◆ GO TO: Step 4 ⇒ page 730 . – NO: ◆ REPAIR: Any ABS concerns 1st. ◆ GO TO: Step 4 ⇒ page 730 .
4	• Final Procedure • Perform a road test to verify repair. • Do any DTC’s return:	– YES: ◆ Check the DTC memory. Refer to ⇒ M3.3.3 ode 03 – Read DTC Memory”, page 21 . ◆ Perform the diagnostic procedure for that DTC. – NO: ◆ Repair is complete. Generate readiness code. Refer to ⇒ C3.2 ode”, page 15 . ◆ Return vehicle to Customer.

DAB 7-29-22 FB

Cautions & Warnings

Please read these WARNINGS and CAUTIONS before proceeding with maintenance and repair work. You must answer that you have read and you understand these WARNINGS and CAUTIONS before you will be allowed to view this information.

- If you lack the skills, tools and equipment, or a suitable workshop for any procedure described in this manual, we suggest you leave such repairs to an authorized Volkswagen retailer or other qualified shop. We especially urge you to consult an authorized Volkswagen retailer before beginning repairs on any vehicle that may still be covered wholly or in part by any of the extensive warranties issued by Volkswagen.

- Disconnect the battery negative terminal (ground strap) whenever you work on the fuel system or the electrical system. Do not smoke or work near heaters or other fire hazards. Keep an approved fire extinguisher handy.

- Volkswagen is constantly improving its vehicles and sometimes these changes, both in parts and specifications, are made applicable to earlier models. Therefore, part numbers listed in this manual are for reference only. Always check with your authorized Volkswagen retailer parts department for the latest information.

- Any time the battery has been disconnected on an automatic transmission vehicle, it will be necessary to reestablish Transmission Control Module (TCM) basic settings using the Volkswagen Factory Approved Scan Tool (ST).

- Never work under a lifted vehicle unless it is solidly supported on stands designed for the purpose. Do not support a vehicle on cinder blocks, hollow tiles or other props that may crumble under continuous load. Never work under a vehicle that is supported solely by a jack. Never work under the vehicle while the engine is running.

- For vehicles equipped with an anti-theft radio, be sure of the correct radio activation code before disconnecting the battery or removing the radio. If the wrong code is entered when the power is restored, the radio may lock up and become inoperable, even if the correct code is used in a later attempt.

- If you are going to work under a vehicle on the ground, make sure that the ground is level. Block the wheels to keep the vehicle from rolling. Disconnect the battery negative terminal (ground strap) to prevent others from starting the vehicle while you are under it

- Do not attempt to work on your vehicle if you do not feel well. You increase the danger of injury to yourself and others if you are tired, upset or have taken medicine or any other substances that may impair you or keep you from being fully alert.

- Never run the engine unless the work area is well ventilated. Carbon monoxide (CO) kills.

- Always observe good workshop practices. Wear goggles when you operate machine tools or work with acid. Wear goggles, gloves and other protective clothing whenever the job requires working with harmful substances.

- Tie long hair behind your head. Do not wear a necktie, a scarf, loose clothing, or a necklace when you work near machine tools or running engines. If your hair, clothing, or jewelry were to get caught in the machinery, severe injury could result.

- Do not re-use any fasteners that are worn or deformed in normal use. Some fasteners are designed to be used only once and are unreliable and may fail if used a second time. This includes, but is not limited to, nuts, bolts, washers, circlips and cotter pins. Always follow the recommendations in this manual - replace these fasteners with new parts where indicated, and any other time it is deemed necessary by inspection.

next

Cautions & Warnings

- Illuminate the work area adequately but safely. Use a portable safety light for working inside or under the vehicle. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.

- Friction materials such as brake pads and clutch discs may contain asbestos fibers. Do not create dust by grinding, sanding, or by cleaning with compressed air. Avoid breathing asbestos fibers and asbestos dust. Breathing asbestos can cause serious diseases such as asbestosis or cancer, and may result in death.

- Finger rings should be removed so that they cannot cause electrical shorts, get caught in running machinery, or be crushed by heavy parts.

- Before starting a job, make certain that you have all the necessary tools and parts on hand. Read all the instructions thoroughly; do not attempt shortcuts. Use tools that are appropriate to the work and use only replacement parts meeting Volkswagen specifications. Makeshift tools, parts and procedures will not make good repairs.

- Catch draining fuel, oil or brake fluid in suitable containers. Do not use empty food or beverage containers that might mislead someone into drinking from them. Store flammable fluids away from fire hazards. Wipe up spills at once, but do not store the oily rags, which can ignite and burn spontaneously.

- Use pneumatic and electric tools only to loosen threaded parts and fasteners. Never use these tools to tighten fasteners, especially on light alloy parts. Always use a torque wrench to tighten fasteners to the tightening torque listed.

- Keep sparks, lighted matches, and open flame away from the top of the battery. If escaping hydrogen gas is ignited, it will ignite gas trapped in the cells and cause the battery to explode.

- Be mindful of the environment and ecology. Before you drain the crankcase, find out the proper way to dispose of the oil. Do not pour oil onto the ground, down a drain, or into a stream, pond, or lake. Consult local ordinances that govern the disposal of wastes.

- The air-conditioning (A/C) system is filled with a chemical refrigerant that is hazardous. The A/C system should be serviced only by trained automotive service technicians using approved refrigerant recovery/recycling equipment, trained in related safety precautions, and familiar with regulations governing the discharging and disposal of automotive chemical refrigerants.

- Before doing any electrical welding on vehicles equipped with anti-lock brakes (ABS), disconnect the battery negative terminal (ground strap) and the ABS control module connector.

- Do not expose any part of the A/C system to high temperatures such as open flame. Excessive heat will increase system pressure and may cause the system to burst.

- When boost-charging the battery, first remove the fuses for the Engine Control Module (ECM), the Transmission Control Module (TCM), the ABS control module, and the trip computer. In cases where one or more of these components is not separately fused, disconnect the control module connector(s).

- Some of the vehicles covered by this manual are equipped with a supplemental restraint system (SRS), that automatically deploys an airbag in the event of a frontal impact. The airbag is operated by an explosive device. Handled improperly or without adequate safeguards, it can be accidentally activated and cause serious personal injury. To guard against personal injury or airbag system failure, only trained Volkswagen Service technicians should test, disassemble or service the airbag system.

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Cautions & Warnings

- Do not quick-charge the battery (for boost starting) for longer than one minute, and do not exceed 16.5 volts at the battery with the boosting cables attached. Wait at least one minute before boosting the battery a second time.

- Never use a test light to conduct electrical tests of the airbag system. The system must only be tested by trained Volkswagen Service technicians using the Volkswagen Factory Approved Scan Tool (ST) or an approved equivalent. The airbag unit must never be electrically tested while it is not installed in the vehicle.

- Some aerosol tire inflators are highly flammable. Be extremely cautious when repairing a tire that may have been inflated using an aerosol tire inflator. Keep sparks, open flame or other sources of ignition away from the tire repair area. Inflate and deflate the tire at least four times before breaking the bead from the rim. Completely remove the tire from the rim before attempting any repair.

- When driving or riding in an airbag-equipped vehicle, never hold test equipment in your hands or lap while the vehicle is in motion. Objects between you and the airbag can increase the risk of injury in an accident.

I have read and I understand these Cautions and Warnings.

back OK

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